DEVELOPMENT OF THE OBESITY CONTROL PROGRAM IN ELEMENTARY SCHOOL STUDENTS

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ABSTRACT

Overweight and obesity in children are the problems that should speed up solving. Development of the obesity control program by participation of all parties was necessary to conduct. The aim of this study was to develop and test the obesity control program in elementary school student with participation from students, parents, and school. This study was separated to 3 phases as 1) Existing knowledge analysis from lesson learned in 4 Diamond Level Health Promoting Schools (DLHPS) and literature review; 2) Program development from the knowledge analysis and participation of students, parents, and teachers; and 3) Implementing and program evaluation by comparison in 2 private schools at Nakornnayok Province (students grade 1-3 and parents 84 persons). Data were collected by both qualitative and quantitative methods. Data analysis used Content analysis and Repeated measure.

The obesity control program included 8 activities that were 1) health education, 2) healthy food, 3) integration of contents to all subjects, 4) nutrition, physical activity, perceptions and physical fitness assessment, 5) plant the vegetables, 6) healthy day/ healthy corner, 7) newsletter for parents, and 8) exercise in the morning. Parents, teachers, and food cookers in school received the obesity control knowledge. At the end of the obesity control program, the nutritional status of students was improved. The calories of dietary intake per day and the body fat percentage in students were decreased (p-value<.001, .009 respectively. The energy expenditure per day in students was increased (p-value=.035).

The obesity control program could reduce the over consumption of calories and increase the physical activity and energy expenditure per day. The key success factor was the participation of students, parents and teachers. Therefore, the continuity and sustainability were occurred in the obesity control program.

KEY WORDS: DEVELOPMENT / OBESITY CONTROL PROGRAM / ELEMENTARY SCHOOL / HEALTH PROMOTING SCHOOL

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การพัฒนาโปรแกรมการควบคุมภาวะโภชนาการเกินในเด็กนักเรียนชั้นประถมศึกษา
DEVELOPMENT OF THE OBESITY CONTROL PROGRAM IN ELEMENTARY SCHOOL STUDENTS

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บทคัดย่อ

ภาวะโภชนาการเกินในเด็กเป็นปัญหาที่มีความจำเป็นเร่งด่วนในการแก้ไข การพัฒนาโปรแกรมการควบคุมภาวะโภชนาการเกินที่ให้ความสำคัญกับการมีส่วนร่วมของผู้ที่มีส่วนเกี่ยวข้องจึงมีความจำเป็นอย่างยิ่ง การศึกษานี้เพื่อพัฒนาและทดสอบโปรแกรมการควบคุมภาวะโภชนาการเกินในนักเรียนชั้นประถมศึกษาโดยการมีส่วนร่วมของนักเรียน ผู้ปกครอง และ โรงเรียน แบ่งเป็น 3 ระยะ คือ 1) การวิเคราะห์ความรู้ที่มีอยู่ บทเรียนจากโรงเรียนส่งเสริมสุขภาพระดับเพชร 4 โรงเรียน และการทบทวนงานวิจัย 2) การพัฒนาโปรแกรม โดยใช้ความรู้ที่ได้จากการวิเคราะห์และการมีส่วนร่วมของนักเรียน ผู้ปกครอง และ ครู 3) การดำเนินงานและประเมินผลโปรแกรมโดยเปรียบเทียบใน 2 โรงเรียนเอกชน ในจังหวัดนครนายก (นักเรียนชั้นประถมศึกษาปีที่ 1-3 และผู้ปกครอง จำนวน 84 คน) การเก็บรวบรวมข้อมูลใช้ทั้งเชิงคุณภาพ และเชิงปริมาณ การวิเคราะห์ข้อมูลใช้ Content analysis และ Repeated measure

ผลการศึกษาพบว่าโปรแกรมการควบคุมภาวะโภชนาการเกินในนักเรียนประกอบด้วย 8 กิจกรรมหลัก คือ 1) การสอนโภชนศึกษา 2) การบริโภคอาหารสุขภาพ 3) การบูรณาการเนื้อหาการควบคุมโรคอ้วนในทุกรายวิชา 4) การประเมินการบริโภคอาหาร การออกกำลังกาย การรับรู้เกี่ยวกับโรคอ้วน และสมรรถภาพทางกาย 5) การปลูกผักสวนครัว 6) กิจกรรมและมุมสุขภาพ 7) จดหมายข่าวถึงผู้ปกครอง และ 8) การออกกำลังกายตอนเช้า ซึ่งผู้ปกครอง ครู และผู้ประกอบอาหารในโรงเรียนได้รับความรู้ในการป้องกันภาวะโภชนาการเกิน เมื่อสิ้นสุดโปรแกรมนักเรียนมีภาวะโภชนาการที่ดีขึ้น สามารถลดพลังงานที่ได้รับจากอาหารต่อวัน (p-value<.001) มีร้อยละของไขมันในร่างกายลดลง (p-value=.009) และเพิ่มการใช้พลังงานจากการออกกำลังกายในแต่ละวัน (p-value=.035).

ผลการวิจัยชี้ให้เห็นว่าโปรแกรมควบคุมภาวะโภชนาการเกินช่วยลดการบริโภคอาหารที่ให้พลังงานเกินความจำเป็นและเพิ่มการใช้พลังงานโดยการออกกำลังกายในแต่ละวัน ปัจจัยแห่งความสำเร็จของการศึกษา คือ การมีส่วนร่วมของนักเรียน ผู้ปกครอง และ ครู ที่ทำให้เกิดความต่อเนื่องและยั่งยืน

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LIST OF ABBREVIATIONS

AIC	Appreciation Influence Control
BEE	Basal Energy Expenditure
BMI	Body Mass Index
CAI	Computer Assisted Instruction
CHO	Carbohydrate
DEXA	Dual Energy X-ray Absorbtionmetry
DLHPS	Diamond Level Health Promoting School
FAT	Fat
FFQ	Food Frequency Questionnaire
MVPA	Moderate or Vigorous intensity Physical Activity
PBF	Percentage Body Fat
PRO	Protein
QUAN	Quantitative
QUAL	Qualitative
RDI	Recommended Daily Intakes
SATST	Sport Authority of Thailand Simplified Physical Fitness
SNOCOP	School-social Network On Childhood Obesity Prevention
WC	Waist Circumference
WHO	World Health Organization

CHAPTER I
INTRODUCTION

1.1 Background and Significance

Overweight and obesity are the global health problem of all ages and countries. Most children are becoming overweight and obesity from the society changing. In the present, prevalence of obesity is rising globally. This led to obesity-related morbidity increasing and refers to the burden on health care systems.

The overweight and obesity prevalence among children and adolescents has raised greatly worldwide (Ebbeling, Pawlak, & Ludwig, 2002). The several researches showed the increasing prevalence of overweight and obesity in children and adolescent estimate 10.3% - 40% (Campagnolo, Vitolo, Gama, & Stein, 2008; Gahagan, 2004; Hedley et al., 2004; Khasnutdinova & Grjibovski, 2010;Roberto et al., 2006). Therefore, the overweight and obesity in children and adolescent are the major health problem concern (Stewart, 2001; Wanda & Kridli, 2009).

The prevalence of obesity in Thailand from a survey of the health status of Thai population from 1996 to 1997 and 2001 by using criteria of weight and height of the Division of Nutrition in 1997 found that the obesity in pre-school children has increasing from 5.8 percent to 7.9 percent by increasing about 36 percent in 5 years. The school children aged 6-13 years has obesity increasing from 5.8 percent to 6.7 percent by increase about 15.5 percent in 5 years. Including the data from the National Health Foundation (NHF) and Thailand Research Fund found that weight and height of primary school children data of 47,389 people in primary schools grade 6 in urban areas across the country for the 268 schools in 2005. The result revealed that 12 % of obese children and 5 % of overweight children (Nutrition division, 2003).

Obesity in children is the serious health problems because this problem strong related to obesity in adult, the adverse health consequences (Mamun et al., 2009). The risk of several diseases in adulthood included the functional limitation and poor life quality (Jensen & Ying Hsiao, 2010) from stroke, cardiovascular disease,

hyperlipidemia, hypertension, diabetes mellitus, insulin resistance, renal failure, gallbladder disease, osteoarthritis, respiratory disease, sleep apnea and some cancers (breast, endometrial, and colon) (Ahmed, Ong, & Dunger, 2009; Garaulet et al., 2011; Kohler & Heuvel, 2008; Lloyd, Langley-Evans, & McMullen, 2010; Sharma et al., 2011; Su et al., 2009).

From the lifestyle changing as westernized country pattern was the major cause of the childhood obesity in Thailand (Likitmaskul, 2002) that included the shift in the proportion of food meal at home came from ready-to-eat food (Kosulwat, 2002). In the present, Thai children change eating behavior by emphasized on high-calorie foods and sweet food that were fried eggs, fried pork, crispy snacks, sausages, cake, candy, sweetened beverage and milk. These unhealthy foods contributed factor to overweigh and obesity children (Sirikulchayanonta, Pavadhgul, Chongsuwat, & Klaewkla, 2010).

The statistic of Thailand Health profile 2008-2010 report showed that teenagers prefer western foods more than Thai food. The ready-to-cook or semi-cooked food effected from rushing lifestyles. Therefore, Thai people consumed vegetables lower than the recommended daily requirement levels. During the past two decades, Thai people consumed more sugar that has risen 3-fold from 12.7 in 1983 to 31.2 kg./person/year in 2009. The candy was the highest conduction trend by according to 1 of 5 of children age 6-14 years old like sweetened food more than the other groups. Crispy snacks and carbonated drink consumption tends to be rising in Thai children according to the increasing of convenience store, several types of snack and snack advertising in T.V.

The contributing factors of overweight and obesity in Thai children are not only changing in eating behavior but also the physical activity pattern. From the National Statistical Office report about the spending of leisure-time in 2004 among people aged 10 years and over was 2.7 hours/day. The lifestyle and leisure-time spending in Thai people came from the media such as television and the internet (Bureau of Policy and Strategy, 2011). The Thai children’s television viewing and game playing of more than 5 hours/day had a positively significant correlation with obese children (Pornpojamarn, 2003). The survey of the National Statistical Office in 2004 revealed that about 29.6% of Thai people regularly exercised. However, the

trend in 1987-2007 for regular exercise found that Thai people had a fluctuating rate of exercise for 20 to 30% on average, females exercise less than males, and the prevalence of exercise decreased in adolescent (Bureau of Policy and Strategy, 2011).

According to aforementioned, this statistic showed the real situation that is impact on overweight and obesity children in Thailand. Therefore, the childhood obesity solving is a special concern. There are many efforts to solve this problem such as nutrition only (James, Thomas, Cavan, & Kerr, 2004; Manora, Powwattana, Thaingtham, & Chongsuwat, 2010), physical activity only (Martins et al., 2010), physical activity and nutrition (Thompson et al., 2008), nutrition, physical activity and family involvement (Bayer et al., 2009; Weigel et al., 2008), nutrition and family involvement (Weides et al., 2010), nutrition, physical activity and teacher involvement (Flattum, Friend, Neumark-Sztainer, & Story, 2009), nutrition, physical activity, family involvement and teacher involvement (Jouret et al., 2010; Kang, Ryu, & Park, 2008; McVey, Tweed, & Blackmore, 2007; Pongpitak, Haputta, & Robchanachai, 2008; Thomas et al., 2006; Williamson et al., 2008), nutrition, physical activity, family involvement ,teacher involvement and multidisciplinary (Eneli, Cunningham, & Woolford, 2008), and nutrition, physical activity, family involvement ,teacher involvement and community involvement (Taylor et al., 2007).

The implementation for obese children solving not only the nutrition, physical activity and the involvement of participants but also the National policy especially health promoting school can remedy this problem. The school health promotion model for application on the nutrition promotion can increase the knowledge and attitude toward nutrition promotion in primary school students. Therefore, the school health promotion model should be applied in schools for promotion the nutrition behaviors (Nuchanon, 2003). Furthermore, several studies related to the established program for obesity prevention in children by using the nutrition and physical activity program from the previous studies (Beth Yano, Ebesutani, Lu, & Choy, 2009; DeMattia, Lemont,& Meurer,2012; Howard, 2007). Most of these studies evaluated outcome of program including the knowledge, attitude, and practice or consumption and physical activity behavior, the nutritional status such as weight for height.

At present, the several methods of childhood obesity prevention are established by several researchers but the outcomes of the study do not sustainable. In order to overcome this limitation, the combination method of National policy or Health promoting school strategies, review literature from the successful study and the collaboration of participants in school can resolve this problem.

Nakhornnayok province is now facing with overweight and obesity in children because it is close to Bangkok from the people's life styles changing such as the eating behavior and physical activities. The Public health department report in 2009 found that 9.7% of men and 29.7% of women as being obesity (Public health department, 2009). When compared percentage with province near to Bangkok including that Nakhornnayok, Nonthaburi, Sageaw, Singburi, Chonburi, and Chachandsau province found that 22.5%, 21.2%, 19.1% 17.4%, 15.6%, and 15.1%, respectively (Public health department, 2009). The overweight and obesity prevalence in Bangkok and the central region had higher prevalence than other regions. This result might be related to the difference in diet, physical activity, culture and socio-economic factors (Aekplakorn et al., 2004). Furthermore, Nakhornnayok province has the higher prevalence of stroke, ischemic heart disease, hypertension and diabetes mellitus in 2005-2009 (Department of Public health strategy development, 2011).

Christasongkroc School is one of four private schools in Ongkharak district, Nakhornnayok province that has the highest total student numbers. Christasongkroc School composes of grade 1-6 in elementary level and grade 1-3 in secondary level that is one of two private schools have the elementary student level. The health report of Christasongkroc School showed the increasing prevalence of overweight children in 2008, 2009, 2010, and 2011 as 4.90%, 8.27%, 8.30%, and 8.40%, respectively. In 2011, the elementary level grade 1-3 has overweight prevalence higher than elementary level grade 4-6 and secondary level grade 1-3 as 8.65%, 8.08% and 5.44%, respectively. Therefore, the researcher selects the elementary level grade 1-3 for participant because of the highest overweight and obesity prevalence in this school and according to childhood obesity prevalence of Thai statistic.

In Thailand, the health policy was conducted for solving the obesity in children but this had the limitation about document of activity and process of obesity

control program. The school administration for health promotion in diamond level of health promoting schools (DLHPS) does not clear in core process of obesity prevention in school despite of the same objective according to Ministry of Public Health. Therefore, the researcher is interested in this process of obesity control program that is the guideline for develop the obesity prevention project in other schools by using the participation of students, teachers, parents and community for development the obesity control program.

In this study, the researcher would like to development of the obesity control program in elementary school student. The first step, the researcher studied the obesity control program from DLHPS and previous studies because these were the existing data and the guideline for obesity control program. Furthermore in the next step, the researcher needs to examine and develop the guideline for prevention childhood overweight by using the participants in selected school. The aims of this dissertation were to study the design, analyze strategies, and means of activities of obesity control program from DLHPS. The last objective of this study was to develop the new program with involvement from school, students and parents.

The research outcomes of this study significantly resulted in obesity control program for establishing development and training guidelines and policy advocacy in terms of obesity prevention in an appropriate way to school health teachers in school that appropriate with school context. For the future every school in the country going to change the health promoting schools by have the obesity control program.

1.2 Research Questions

Whether or not the obesity control program which develops by participation of school, students, and parents would be able to improve nutritional status in elementary school students?

1.3 Research Objectives

1.3.1 To design, analyze strategies, and means of activities in obesity control program from the diamond levels health promoting schools.

1.3.2 To develop and test the new program with participation from school, students, and parents.

1.4 Research Hypotheses

1.4.1 After the experiment, the students in the obesity control program would be able to do better than those in the control group and before experiment in the following aspects:

1) Children's perception of their obesity
2) Children's consumption behavior
3) Children's physical activities and exercise behavior
4) Children's body fat percentage

1.4.2 After the experiment, the parents in the obesity control program would be able to do better than those in the control group and before experiment in the following aspects:

1) Parent's perception of obesity in their child
2) Parent's consumption behavior
3) Parent's physical activities and exercise behavior

1.5 Variables of the Study

1.5.1 Independent variables

Obesity control program

1.5.2 Dependent variables

1.5.2.1 Process evaluation

- Collaboration
- Satisfaction

1.5.2.2 Output evaluation

Children:

- Perception of their obesity
- Consumption behavior
- Physical activities and exercise behavior

Parents:

- Perception of obesity in their child
- Consumption behavior
- Physical activities and exercise behavior

1.5.2.3 Outcome evaluation

Children:

- Physical fitness
- Nutritional status
- Adiposity outcome
- Body fat percentage

1.6. Definition of Terms

The theoretical and operational definitions of terms are explained as follows:

The obesity control program based on embedded experimental research design; mixed method. The process of implementation develops from the DLHPS, the review literature of successful obesity control program from the previous studies and collaboration with students, teachers, and parents in selected school and the specialists.

This obesity control program focused on the participation of students, teachers, and parents in selected school. The activities of program consists of eight activities that were 1) nutrition education*;* 2) healthy food; 3) teacher meeting for integrative the nutrition content to all subjects; 4) nutrition, physical activity, perceptions and physical fitness assessment; 5) plant the vegetables at home; 6) healthy day/healthy corner; 7) newsletter; and 8) exercise in the morning.

Collaboration referred to working together towards goal achievement. This could be measured by the number of participant in program and their activity involvement.

Satisfaction referred to the feelings of the individual towards the obesity control program. It can be positive or negative about the outcome of the program. This could be measured by the positive outcome of the program.

Children's perception of their obesity referred to children sensory perception or feeling toward theirs obesity and the perceived health status including the prior health, current health, health outlook, resistance and susceptibility to illness, health worry and concern, and sickness orientation. The output of the children's perception of their obesity should be increase in score.

Children's consumption behavior referred to child eating behaviors including frequency of meal consumption, type and frequency of food consumption as follows: sweet food (Thai dessert, bakery, candy and chocolate), snack, fast and fat food, soft drink, fruits juice and fruits. These variables will be measured as frequency by for three-day food records of 2 weekdays and 1 weekend day for estimation the calories of food per day. The output of the children's consumption behavior should be decrease in calories of food.

Children's physical activities and exercise behavior referred to of a child's activities including physical activity and exercise or all moving activities. This variable was measured as a period of time that a child parent spent in all moving

activities in a day including the time of doing routine activities, playing sports and sedentary behavior for estimation the energy expenditure of physical activity and exercise per day.

Parents Theoretically, a parent was defined as a father or a mother (Webster's New World Dictionary, 1994). For the purposes of this study, a parents referred to a mother, father, and grandparent or relative who was the most significant person taking care of the students.

Parent's perception of obesity in their child referred to parent's sensory perception or feeling toward their child's obesity and the perceived health status of their children including the prior health, current health, health outlook, resistance and susceptibility to illness, health worry and concern, and sickness orientation. The output of the parent's perception of their obesity should be increase in score.

Parent's consumption behavior referred to parent's eating behaviors in term of the frequency of meal consumption and calories of dietary intake per day. The output of the parent's consumption behavior should be decrease in calories of food.

Parent's physical activities and exercise behavior referred to behaviors of parent's activities including physical activities and exercises or all moving activities. This variable was measured as a period of time that a parent spent in all moving activities in a day including the time of doing routine activities, playing sports and sedentary behavior for estimation the energy expenditure of physical activity and exercise per day. The output of the parent's physical activities and exercise behavior should be increase in energy expenditure of physical activities and exercise.

Children's physical fitness referred to physical fitness of children including speed, muscle power, muscle strength, muscle endurance, agility, flexibility and general endurance. This variable was measured by 5 activities assessment including push-ups 30 seconds, sit-ups 60 seconds, sit and reach, standing

broad jump, and zig-zag run. The outcome of the children's physical fitness should be improved.

Children's nutritional status evaluated by using weight for height criteria for growth status estimating in Thai Children or Body Mass Index Percentiles; BMI Percentiles as follows: Childhood obesity is defined as a child who has over 3 SDs above the median, Childhood overweight is defined as a child who has 2 to 3 SDs above the median, Childhood at risk of overweight is defined as a child who has 1.5 to 2 SDs above the median, and Childhood normal weight is defined as a child who has between 1.5 above the median and 1.5 SDs below the median (MOPH, 1999).

Children's adiposity outcome referred to the anthropometry and body composition assessment. The anthropometry assessment was triceps and subscapular skinfolds. The body composition assessment was weight and waist circumference. The outcome of the adiposity outcome should be decrease.

Children's body fat percentage referred to the amount of fat tissue in body as a total body weight percentage. For the purposes of this study, skinfold thickness was used for measures of subcutaneous fat by using a well-calibrated caliper. This study measures skinfold thickness as triceps and calculates by equation formula of Dezenberg et al., 1990. The outcome of the body fat percentage should be decrease.

CHAPTER II
LITERATURE REVIEW

This chapter presents the review of theoretical and empirical literature in 4 main topics parts. The purposes are to assist in conceptualization and provide direction for the formulation of this research. The 4 main topics part are presented as follows.

1. Overweight and obesity children
2. Obesity management for children
3. The National Policy for obesity in school
4. The embedded experimental research design

Part 1: Overweight and Obesity children

Overweight is defined as increased body weight above the standard from the buildup and storage of fat in the body until that is hazardous to health. Obesity is the imbalance between the nutrition intake rate and utilization of basal energy that lead to the increasing of fat cell. Childhood obesity is defined by comparison of indirect measures of body composition and fat distribution with population norms. The standard for estimating growth status in Thai children aged 5-18 years old is growth charts, which is a necessary indicator to monitor the growth in child. Childhood obesity is defined as a child who has over 3 SDs above the median, Childhood overweight is defined as a child who has 2 to 3 SDs above the median, Childhood at risk of overweight is defined as a child who has 1.5 to 2 SDs above the median, and Childhood normal weight is defined as a child who has between 1.5 above the median and 1.5 SDs below the median (MOPH,1999).

1.1 School children and physical development

Elementary school students are children ages 6-12 years old. In this age period, the many transition changes occur such as size, shape, muscle, fat and hormone.

1.1.1 The shape and size patterns of change

The babies will gains height by rapidly until 2 years old. The adolescent can have dramatic "growth spurt" until final adult size. The curves from figure 2-1 present the height in each year since birth. This graft review that all children grow rapidly between the age of about 9 and 15 by the preschool and elementary school years have the slower growth than infancy, and adolescence (Malina, 1990; Tanner, 1990).

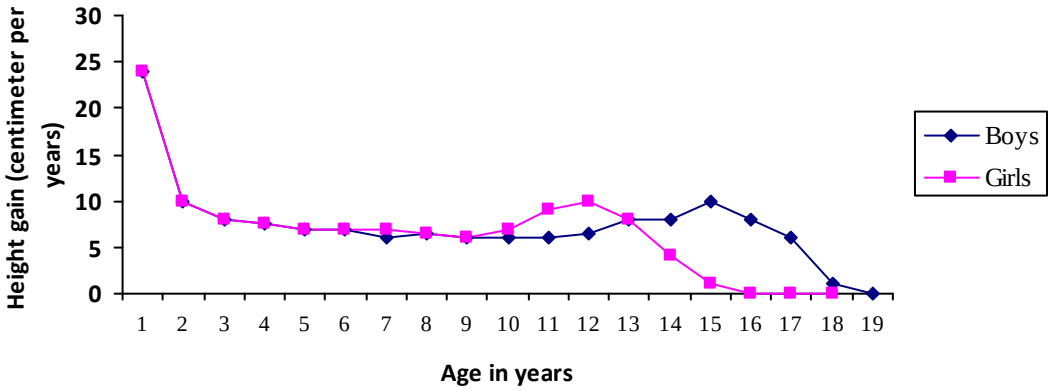

Figure 2-1: The gain in height for each year

Data from: Malina, R.M. (1990). Physical growth and performance during the transitional years (9-16). In R. Montemaypor, G.R. Adams, & T.P. Gullotta (Eds.), *From childhood to adolescence: A transitional period?* (pp.41-62). Newbury Park, CA: Sage.

1.1.2 Muscles and fat

The muscle fibers and bones quality can develop since infancy until adolescence. The subcutaneous fat will develop about 9 months after birth and the layer of fat thickness will reduces until 6 or 7 years old and increase until adolescence (Tanner, 1990).

1.1.3 Hormones

The hormones from various endocrine glands secrete for puberty growth and physical changes in the body. Pituitary growth hormone and thyroid hormone help to order the growth rate in children.

The growth hormones can set the body changes such as set of changes in body organs and development of the sex organs in body.

Thyroid hormone secretes in first 2 years of life and reduces for constant until adolescence (Tanner, 1990). The adrenal androgen has increase levels and begins to be secreted in greater amounts of puberty at 7-8 years old (McClintock & Herdt, 1996) as Figure 2-2.

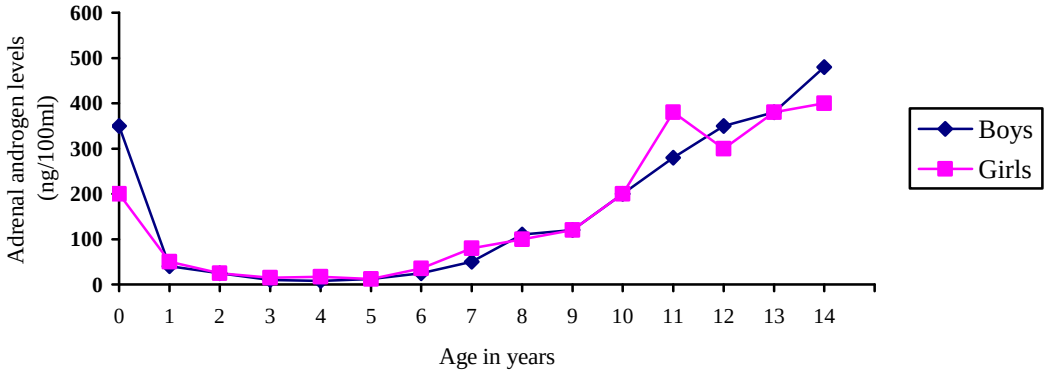

Figure 2-2: The hormone changing in prior to and adolescence.
Data from: McClintock, M., & Herdt, G. (1996). Rethinking puberty: The development of sexual attraction. *Current Directions in psychological Science, 5(6),* 181.

1.1.4 Early Self-Definitions

The question beginning of self-awareness in the preschool children was “who I am” by learning their social. The 2 years old can know their name and can tell you about the gender and shape of them. The children of age 5-7 have clear understanding of competence about their tasks such as study knowing, life skill and social skill (Harter, 1999).

1.1.5 The Impact of entertainment Media

Entertainment media television including the movies, radio, CDs, video games, and the like are a pervasive part of most children’s environments.

Role models in a TV are particularly influential and associated with stigmatizing attitudes towards obese children (Latner, Rosewall, & Simmonds, 2007). Obesity problem received the influence from food advertising. The study of Keller & Schulz (2010) found that most advertisement is unhealthy food. There are showed that the commercials of food having an impact on food consumption in childhood obesity.

The marketing of unhealthy food such as high fat, sugar, and calorie foods is increasing target to children and adolescents. The surveys found that children's bedrooms have television about 50% to 70%. Thus, children can watch more hours of television by lack of the monitor of parents (Dennison & Edmunds, 2008).

The families should create the conditions for television watching tend to childhood obesity (Bee & Boyd, 2007; Springer et al., 2010).

1.1.6 Attachment to parents

Parenting style and discipline practices have construction for children's autonomy, psychological well-being and emotional development. The study of Levitt, Guacci-Franco, & Levitt (1993) found that 14-year-olds children group was supported by friends than the younger children.

The child rearing patterns

Baumrind (1973) studied the 4 child rearing styles from parent as 1) warmth, 2) level of expectations; 3) the clarity and consistency of rules, and 4) communication between parent and child. The four specific combinations of these characteristics including as: permissive style, authoritarian style, authoritative style, and neglecting style (Baumrind, 1991; Glasgow et al., 1997). The authoritative style helps school grade point average. When considering the parental rearing and obesity in children found that the authoritarian parental rearing practice was correlated with obese children (Pornpojamarn, 2003) and help preschoolers eat healthy food by themselves (Wood, 2010). Obesity in children, especially older children, also predicts adult obesity and chronic disease, its morbid consequences. The obesity is hard to treat, not only because of entrenched behaviors but also because physiological mechanisms tend to resist weight loss. These reasons conclude that we should parental rearing initial promotion and prevention as early as possible or before birth (Kopelman, Caterson, & Dietz, 2010). The obesity intervention in early age can help

to improve obesity (Guyer et al., 2009) such as physical activity, fruits and vegetables consumption, and television time (Driskell et al., 2008; Moore et al., 2003).

1.2 The Prevalence of Obesity children

From 1960 to 1980, child population aged 6-19 years old had the prevalence of childhood overweight and obesity about 4% to 7%. The prevalence was increasing about 11% and 16% from 1988 to 1994 and 1999 to 2002, respectively (Forum on Child and Family Statistics, 2005). Epidemic of obesity children has become a staggering reality in over the last three decades (DeMattia & Denney, 2008). Prevalence estimates for overweight and obesity in children and adolescent have increased in many developing countries and European countries such as USA, Italy, Portuguese, and Scotland (Baratta et al.,2006; Neumark-Sztainer et al., 2006; Padez., 2006; Parikh et al., 2007; Singh, Siahpush, & Kogan, 2010; The Scottish Government, 2010). The trend of overweight and obesity in children has been found in some Asian countries such as Taiwan, Singapore, Korea, Japan, China, and Thailand. This phenomenon is closely correlated to economic development (International Association for the Study of Obesity, London – January 20th 2010).

In Thailand

During the past 20 years, the overweight and obesity prevalence among children and adolescents has increased dramatically by consistency with several studies (Chrzanowska & Ulijaszek, 2007; Langendijk et al., 2003; Mo-suwan, 2000). The children from private schools are more overweight than public schools and the children from urban communities are more overweight than rural areas. From the study of overweight and obesity prevalence in children in both areas of Thailand found that the urban area has increasing of obesity 22.7% in urban and 7.4% in rural areas (Sakamoto, Wansorn, Tontisirin, & Marui, 2001), whereas Aekplakorn et al., (2009) found that the rural area has increasing trend of obesity in 6-12 years old from 5.8% in 1997 to 6.7% in 2001 for the 6–12 years old.

The two national surveys revealed that in 1991 and 1996 have increasing of the overweight and other risk factors problem especially cardiovascular disease by relationship with causes of death in Thai people (Kosulwat, 2002).

1.3 Factors of overweight and obesity

Childhood obesity is the challenging problems faced by the pediatric health care provider. In the United States, the children have been estimated to be significantly overweight about 25%. Obesity in children and adults has the risk of diabetes, hyperlipidemia, hypertension and cardiovascular disease (Ahmed, Ong, & Dunger, 2009; Angelopoulos et al., 2009; Din-Dzietham, Liu, Bielo, & Shamsa, 2007; Lorch & Sharkey, 2007). Furthermore, the obese children had significantly higher levels of depressive symptoms and lower self-esteem from body dissatisfaction than the normal weight children (Young Shin & Sup Shin, 2008). Although, the factor of obesity in children are not completely clear. Several factors have been identified as causative links between incidence of overweight and obese children (Small & Strasser, 2007). The Factors of overweight and obesity as follows:

1.3.1 Genetics

The combination of genetic and environmental factors effects to the obesity that relate with food consumption, activity level, and metabolic rate. The both of mother and father's obesity factors associated with obesity in children (Vanhala et al., 2009). The genetic contribute to human body weight. The estimated heritability for body weight is 40-70% (Barsh, Farooqi, & O'Rahilly, 2000; Herrera, Keildson, & Lindgren, 2011).

More than 250-300 genes have been influenced to obesity (Karasu & Karasu, 2010). The variance in BMI is attributed to genetics about 30% - 40% and environment about 60% - 70% (Pi-Sunyer, 2002). Genetics does not cause obesity but are involved in how likely a person is to gain or lose weight in response to changes in calorie intake by in influencing basal metabolic rate, response to overeating, and where body fat is distributed (O'Neil et al., 2007). Supporting the case for a genetic basis to weight management is the trend of adopted children to have similar weights to their biological parents, not their adoptive parents (Sabin, Werther, & Kiess, 2011). Identify genetic variants of single nucleotide polymorphisms (SNPs) within various genes showed associations to BMI (Melen et al., 2010). The factors associated with obesity were mother's obesity (OR 13.04, CI=2.81- 60.53) and father's overweight (OR 5.89, CI=1.23 - 28.10) (Vanhala et al., 2009).

1.3.2 Dietary intake

The food consumption pattern changing was surveyed in population. Both rural and urban settings have increased the obesity prevalence that resulted ready to eat food, the proportion on food prepared at home, expended on purchased, and increase in the consumption of high-fat foods and sugar in beverage (Kosulwat, 2002). Various dietary factors were positively associated with child's overweight or obesity. From the research of Vanhala et al., (2009) studied the risk factors for obesity in 7 years old children. They found that the factors associated with obesity were habitual overeating (OR 9.35, CI=2.58-33.82).

Sweetened beverages have association with overweight and obesity in children (Boumtje, Huang, Lee, & Lin, 2005). The consumption of beverage such as sugar-sweetened beverage is important predictive variables for childhood obesity and was associated with an increase in the total energy intake of the children because increasing in their BMI (Clifton et al., 2011; Ochoa, Moreno-Aliaga, Martínez, & Marti, 2007; O'Connor, Yang, & Nicklas, 2005). The types of weight gain that result from specific food consumption patterns such as westernized pattern, abdominal obesity, and high-body fat proportion.

Moreover, the increase consumption of fruits and vegetables, grill or boil food rather than fry, whereas the reduce food intake of butter, margarine, fats, sugar including the present meals on smaller plates to reduce the volume of food subtly helped to decrease the risk for obesity (Poskitt & Edmunds, 2008). The statistic of Thailand Health profile 2008-2010 report found that teenagers prefer western foods more than local or Thai food. The several studies showed that both male and female had a vegetables and food intake lower than the recommended daily requirement levels (Jimenez-Cruz, Bacardi-Gascon, & Jones, 2002; Robinson-O'Brien et al., 2009; Sirikulchayanonta, Pavadhgul, Chongsuwat, & Klaewkla, 2010).

1.3.3 Physical activity

The physical activity is any movement of body that produced by skeletal muscles or muscular activity and has the results in energy expenditure. The energy expenditure can be measured in kilocalories (Caspersen, Powell, & Christenson, 1985; Plowman & Smith, 2011). The physical activity and exercise adjustment were the main elements in obesity treatment. Thus, children and

adolescents should have moderate or vigorous intensity physical activity (MVPA) for 60 minutes per day was suggested (Riddoch, 2010). Regular physical activity helped to increased insulin sensitivity and reduced blood pressure (Hassink, Zapalla, Falini, & Datto, 2008). The increasing physical activity or exercise and reducing time spent in sedentary activities are strategies for reduce the risk of chronic disease in childhood obesity (Anderson & Sabiston, 2010; Arsenault et al., 2010; Baak, 2010; Boumtje, Huang, Lee, & Lin, 2005; Krebs, Himes, & Jacobson, 2007).

The rapid changes in lifestyle patterns and food intake effect to the shifting pattern of disease burden in the Thai population. These changes should be monitored carefully, and adults must promote the appropriate eating practices, physical activities, and behavior modification (Kosulwat, 2002). Sedentary lifestyle patterns have been related with obesity especially playing digital games, using computers and watching television (Rey-Lopez, Vicente-Rodriguez, Biosca, & Moreno, 2008). The increasing of physical activity promotion in school by physical education, school policy, after school sport help increased the academic achievement at the expense of physical education and physical activity (Stratton, Fairclough, & Ridgers, 2008). Clinical treatment should be both financially supported and encouraged in children who are already overweight. Community should promote environments, increase awareness, encourage physical activity, and healthy nutrition (Sothern, 2004).

1.3.4 Television, Game computer, Internet and overweight

The technological age has resulted in children spending extensive hours in front of television and game computer. At present, there is an assumption that more time spent watching television means less time being physically active and a greater likelihood of becoming overweight or obesity in children. The media not only sharps our view of obesity but may cause obesity. Television watching decreases time for energetic activity, and there is a positive relationship between television viewing and weight gain in childhood. The result shows that children who watched television more than 3 hours per day were more likely to be obese than the children who watched television less with the odd ratio of 1.8 (95% CI = 1.2-2.8) (Ruangdaraganon, Kotchabhakdi, & Udomsubpayakul, 2002). The study of Benner et

al., (2011) confirmed that excessive time spent on the TV view and internet use was positive association with obesity.

Therefore, the parents should demonstrate a good healthy living model for their children such as minimize television viewing and game playing time to less than 2 hr/day, increase playing sport to at least 1 hr/day for the prevention of obesity, and encourage alternative entertainment such as reading, hobbies, and athletics (Pornpojamarn, 2003).

1.3.5 Life style

Lower levels of physical activity, higher levels of soft drinks consumption, and advertising testimonials were predictive of higher BMI (Worthy et al., 2010). A lifestyle of diet modification, exercise, and behavior modification is the basis of treatment for all people whose BMI > 30. The lifestyle approach is also recommended for people with a BMI of 25 to 29.9 who have two or more comorbidities (USDHHS, 2007). The comparison of obese Chinese children, both energy intake and expenditure were lower in non-obese children (Zhang & Wildemuth, 2008). The study of Rehto et al., (2011) found that irregular breakfast, TV viewing, TV in child's room and physical inactivity during school breaks were associated with larger waist circumference. Vanhala et al., (2009) found that the prevalence of overweight was 16.7% and obesity 4.9%. The factors associated with obesity were low physical activity and skipping breakfast. Moreover, the self discipline in children by parents and teachers participation help to develops a child's personal control for obesity prevention (Sirikulchayanonta, Ratanopas, Temcharoen, & Srisorrachatr, 2011).

1.3.6 Parents

Parents are the role models for physical activity and food consumption (Scaglioni, Salvioni, & Galimberti, 2008; Vanhala et al., 2009). Thus, parent should be positive about healthy lifestyle in their family (Stewart, 2011) because family is a main key in the development, prevention and treatment of childhood obesity. Eating and physical activity behaviors are established in a setting of the family (Thorpe & Randal, 2008). Fruits and vegetables consumption in children should be monitored by parents because they can encourage the children's fruits and vegetables consumption for children's healthful eating (Gross, Pollock, & Braun,

2010; Pearson, Biddle, & Gorely, 2008; Vereecken, Rovner, & Maes, 2010). Parents can create environments and promote overweight and aspects of healthy eating for children. The positive parental role model could adjust the consumption in children (Brown & Ogden, 2004; Kang, Ryu, & Park, 2008; Scaglioni, Salvioni, & Galimberti, 2008). The children who receive the authoritarian parental or violent rearing from parents as more disturbed personality were associated with more severe obesity in children and effect to obesity in adult (Favaro & Santonastaso, 1995; Greenfield & Marks, 2009; Pornpojamarn, 2003). The study of Garasky et al., (2009) reveals positive associations between family stressors level and overweight and obesity in children. The family stressors come from the lack of cognitive stimulation and emotional support, the financial strain, and mental and physical health problems.

Moreover, parental support for the healthy lifestyle is vital to beginning and sustaining change in eating and exercise behaviors. Parents often acknowledge that they need to set an example for their children, but lack the time to do so. Still other parents who are overweight may feel they cannot set a good example because they do not practice what they teach. Other obstacles to parents taking action are lack of knowledge and awareness for weight control in children (Susan, 2010). Moreover, restrictive feeding practices, or the type and amount of food permitted by parents lead to child preferences for high in calories and fat foods (Faith, Berkowitz, & Stallings, 2004; Fisher & Birch, 2002).

Environment

The healthy environment can reduce the childhood obesity. Environment influences can promote a sedentary lifestyle include a plentiful of high-calorie density foods and physical activity in low levels such as snacks and soft drink consumption and television watching, computers and video games playing (Rahman, Cushing, & Jackson, 2011; Susan, 2010). Therefore, the policy-related obesity prevention should have healthy places or healthy parks for physical fitness activities in children (Kipke et al., 2007).

1.3.8 Community

The community and food environment was studied for finding relationship in obesity and found the significant results between community food environment variables and obesity incidence (Powell, Slater, & Chaloupka, 2004;

Holsten, 2008). When considering the cost of fruits and vegetables, the areas that have expensive fruits and vegetables will have more the amount of childhood obesity than the less expensive of fruits and vegetables areas (Sturm & Datar, 2005). This finding introduce that children have easy access to fast food, and limited access to both healthy food options and parks in which to engage in physical fitness activities (Kipke et al., 2007). Huberty, Balluff, O'Dell, & Peterson, (2010) also studied a model-driven community for childhood obesity prevention. The results found that the models helped the community identify the activities for sustainable change and improvements in the children health and obesity problem.

1.4 Anthropometric assessment

Obesity is the buildup and storage of fat that is hazardous to health. Childhood obesity is defined in most setting by comparison of indirect measurement in body composition and fat distribution. The anthropometric measurement in obese children and adolescents are most common estimation for body fat and body composition (Himes, 2006). Adiposity can be assessed by various methods as follows:

1.4.1 Dual-energy X-ray absorptiometry (DEXA): is used to measure total and regional body composition, including the estimation of lean soft tissue mass, fat-free mass, fat mass and bone mineral content (Lohman & Chen, 2005). Anthropometric measures are performed relatively quickly, easy, cheap and reliable, especially with trained personnel. The ability of DEXA to measure total body fat is very high ability, and applicability in large population studies is moderate (Snijder, Van Dam, & Visser, 2006). The advantages of DEXA for use in youth are low radiation dose, low accuracy error, better precision and shorter scanning time (Fu, Lee, & Ng, 2003; Martin, 1999; Svendsen, Haarbo, Hassager, & Christiansen, 1993; Wren & Nachtigall, 1996). However, this method could not be operatively applied for a large scale child population because of high cost.

1.4.2 Body Mass Index (BMI): provides an indicator of overweight and obesity for most clinical, screening, and surveillance purposes. However, this method does not provide an accurate assessment in body fat of children and adolescents (Himes, 2006; Krebs, Himes, & Jacobson, 2007). Several obesity treatment programs promote both dietary modifications and an increase in physical

activity but can not reduce BMI by significantly because fat and lean tissue may occur without much change in BMI itself (Epstein & Goldfield, 1999; Hollar et al., 2010; Martins et al., 2010; Wells & Fewtrell, 2008).

1.4.3 Waist circumference: is more related to visceral fat than to total body fat because it is an indicator of childhood obesity (Brambilla, Bedogni, & Moreno, 2006; McCarthy, 2006). Increased central adiposity or waist circumference is recognized as a risk factor for development of resistance (Mack et al., 2004), mortality (Penn et al., 2009), pre-diabetes (American Diabetes Association, 2006), type 2 diabetes (Labayen et al., 2011; Qiao & Nyamdorj, 2010), cardiovascular disease (Farajian, Renti, & Manios, 2008; Janssen, 2009; Liu, Abbasi, & Reaven, 2011; Menke et al., 2007), and hypertension (Chen & Li, 2011; Lee, 2010; Zhang et al., 2012). The sites for anthropometric measurements are showed in Figure 2-3. Most areas for circumferences measurement were midarm, midthigh, waist, and hip, because they present differences among people in major regions of the body (Yamborisut, Sakamoto, Wimonpeerapattana, & Tontisirin, 2010). From the study of Shahar et al., (2009) found that the waist circumference decreased in the intervention group (-1.3 & +1.8 cm, $p<0.01$). The waist circumference could be a good predictor of abdominal fat (Hwang et al., 2008) because of waist circumference was central adiposity and better than other fat mass areas (Kato et al., 2008; Maffeis et al., 2001; Taylor, Jones, Williams, & Goulding, 2000). The most commonly used sites reported in studies that is waist circumference were the 29% at midpoint between the lowest rib and the iliac crest, the 28% at umbilicus, and the 22% at narrowest of waist circumference (Wang, Thornton, & Bari, 2003).

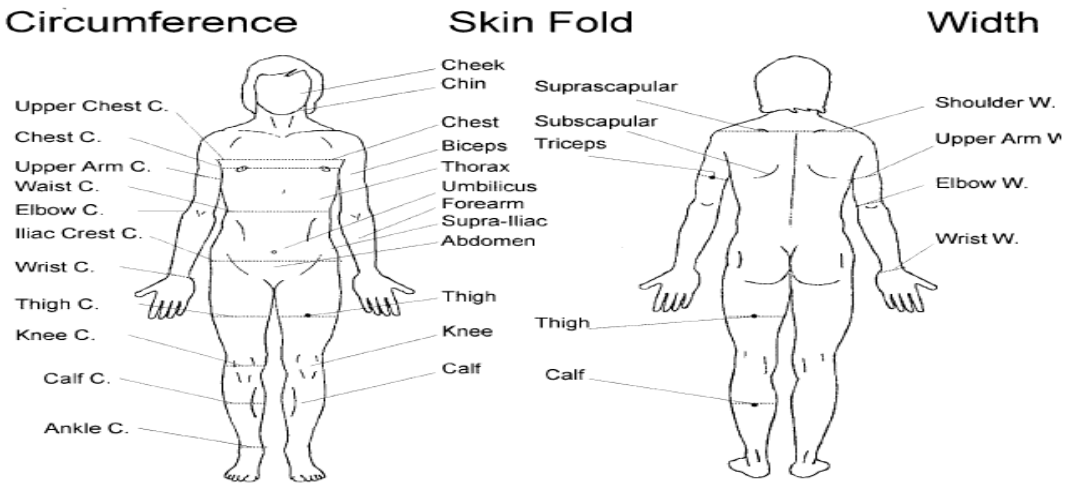

Figure 2-3: Sites for anthropometric measurements.

Data from: Wang, J., Thornton, J.C., Kolesnik, S., & Pierson, J.R. (2002). Anthropometry in Body Composition: An Overview. *Annals of the New York A cademy of sciences, 904,* 317-326.

1.4.4 Skinfold thickness: has long been used as measures of subcutaneous fat by more accurate than BMI at prognosis body fat (Himes, 2006; Krebs, Himes, & Jacobson, 2007). Skinfold thickness can be measured the body fat more accurate than BMI (Ketel, Volman, & Seidell, 2007). About 40–60% of total body fat is in the subcutaneous region in body by using a well-calibrated caliper for anthropometric measurements. Figure 2-3 shows the sites in body that have been used at our center and at several other laboratories. The several equations were predicted for fat and fat-free mass that are triceps, subscapular, abdominal, and iliac crest, thigh, biceps, and calf (Goran, Gower, Treuth, & Nagy, 1998). The many areas of body for measurement such as tricep skinfold is measured between acromion of scapular bone and olecranon process of ulnar bone, subscapular skinfold is measured 1 cm below the inferior angle of the scapular (Yamborisut, Sakamoto, Wimonpeerapattana, & Tontisirin, 2010).

In Thailand the study of Pratanaphon, Chamnongkich, & Hensangvilai, (2007) developed the prediction equations for BMI and fat mass from simple anthropometry in 6 to 8 year old children. The result found that the correlations between waist circumference (WC) and skinfold thickness (triceps, subscapular) were also high. Therefore, BMI, WC and skinfold thickness by measurement triceps and

subscapular were useful tools for evaluating childhood adiposity. Kaewsup, (2008) also studied the effect of aerobic exercise intensity at 60-75% MHR on physical fitness in obese children. The result found that the percent body fat of 10 obese children (age 8 years old) can reduce from 29.27 to 28.31, ($P < 0.05$) after aerobic exercise 60 minutes/day; 5 days/week; 2 months. Triceps, biceps, subscapular and supra-iliac skinfolds were similarly accurate at predicting percentage body fat (PBF) and better than BMI (Kriemler et al., 2010). The equation of body fat percentage in children age 4-10 year old as follows: (Dezenberg et al., 1999; Pratanapon, Chamnongkich, & Hensangvilai, 2006).

The equation is $\frac{[(0.342 \times \text{Weight})+(0.256 \times \text{Triceps})+(0.837 \times \text{Sex})] - 7.388}{\text{Weight}} \times 100$

This research, the anthropometry and body composition assessment at subcutaneous skinfold at triceps, subscapular and waist circumference were useful tools for evaluating childhood adiposity.

Part 2: Obesity management for Children

Lifestyle of children is an important role in the development and maintenance of obesity. Exercise and diet behaviors are modified for treating obese children for retaining improvements in weight status (Limbers, Turner, & Varni, 2008). The systematic review of childhood obesity prevention found that parental involvement and numerous guidelines are the best option for obesity prevention (Wofford, 2008). Including the environment plays such as parks and public transport are fundamental in encouraging for physical activity in people (American Academy of Pediatrics, 2003).

2.1 Treating the child with obesity (Abraham, Robert, & Kim, 2002)

2.1.1 Dietary consumption

Encourage dietary and activity changes can be maintained long-term. Address particular controlling factors regarding the type and quantity of

food ingested and energy expenditure by increase fat, and inappropriate behavioral dynamics.

2.1.2 Physical activity

Encourage participation in aerobic activities to increase energy expenditure for increasing the cardiovascular fitness, and improve self-esteem. Limit sedentary lifestyle such as television watching, video game.

2.1.3. Family

Develop an alliance with child and family about the issues involved and the importance of therapy. Focus assessment and management at the family rather than the individual level.

2.1.3 Environment

Situation or environment includes the watching television of feeling stress that encourages unhealthy eating habits. The remedy is removing unhealthy foods from house, identify and substitute preferred health foods for preferred unhealthy foods.

2.2 Implementation of childhood obesity

2.2.1 Dietary consumption (Diet intervention)

Diet quality can become an issue for obesity prevention. The planning meals for reduce the risk of obesity include the vegetables, fruits, low-fat dairy, and whole grains. Low-fat cooking techniques are necessary to keep fat content down. High-fat and high-sugar foods should be avoid (Colles, Dixon, & O'Brien, 2008). The basic nutrition concepts that should be treat pediatric obesity because the available effective dietary interventions. The dietary interventions was included developing a nutritionally balanced and portion controlled eating plan for proper with age for reducing high fat and sugar foods and emphasizing intake of high fiber foods such as fruits, vegetables and whole grains (Fitch & Bock, 2009). Furthermore, Yannakoulia et al., (2010) also studied about the associations between physical activity and diet related lifestyle patterns and obesity in children. The 24 hour recalls and physical activity were analyzed. The results indicated that a high fiber pattern, representing high consumption of whole-grain cereals, legumes, and low intake of sugar-sweetened beverages was negatively correlated with obesity.

2.2.2 Physical activity

Increasing physical activity is an important goal for behavioral treatment of obesity. Physical activity is cause to weight management principally by facilitating the maintenance, rather than the induction (Harris, Kuramoto, Schulzer, & Retallack, 2009). Sedentary activity and obesity have been related with health risks and chronic disease (Physical Activity Guidelines Advisory Committee, 2008). Hill & Wyatt, (2005) found that the exercise for caloric restriction helped to weight loss in 4-6 months about 2-3 kgs. The walking, swimming or biking that are aerobic activity at least 20-30 minutes can increase the maximum heart rate for 60-80% (Stisen, Stougaard, & Langfort, 2006). People who continue to exercise usually after losing weight are more likely to keep off the lost weight. The interventions of children's physical activity were most effective in the school setting composed of physical education lessons, incorporating curriculum, activity breaks, and family strategies (Salmon et al., 2007). Most interventions produced positive changes in body composition such as percent body fat, sum of skinfolds, waist circumference and body mass index (BMI). The intervention and evaluation of school interventions lead to a set of lessons related to epidemiology and evidence-based policy (Brownson et al., 2010). Moreover, the facilitating long-term health behavior change in children remains a challenge (Gorely et al., 2011).

2.2.3 Dietary consumption, Physical activity

The combine method of reducing dietary consumption and increase physical activity is the effect on the decreasing prevalence of childhood obesity. The many studies have showed the advantages of children continuing to attend weight maintenance in weight loss program (Perri & Corsica, 2002). The ultimate goal of program is refer to positive behavior change for obesity prevention (Warren et al., 2003). Successful dietary consumption, physical activity studied can represent as several studies as Thompson et al., (2008) studied food, fun, and fitness internet program for evaluation an e-Health youth obesity prevention program. The result found that pre-to-post differences were observed in fruits, juice, and vegetables consumption ($p=0.002$), and physical activity usually ($p=0.001$). Moreover, Yackobovitch-Gavan et al., (2009) also studied the influence of diet and exercise and quality of life in obese children. The result found that the reductions in BMI were

significantly lesser in the exercise groups. Thus, programs for weight-management should be promoted a healthy eating and physical activity.

2.2.4 Dietary consumption, Physical activity, Curriculum and Family involvement

High-calorie and high-fat foods eating patterns are over portioned and television, computers, and video games are sedentary activities. These lead to obesity in children. Parents or family are largely responsible for creating the social and environmental for promotion in health and well-being of children. The implementation of health promoting schools programs in primary schools and combination of several methods is necessary for reduce childhood obesity as represent study. The 4 components in the intervention such as 1) change in dietary intake, 2) increase in physical activity,3) a classroom curriculum focused on healthy eating and lifestyle, and 4) a family-involvement program helped to reduce the total energy intake in children (Caballero, Clay, Davis, & Ethelbah, 2003). From the study of Wanda & Kridli, (2009) studied the component of intervention from 16 studies. These obesity interventions composed of healthy lifestyle education (100%), dietary habit interventions (88%), physical education programs (88%).

Furthermore, the several studies shown the effectiveness of school-based programs in the prevention childhood obesity in school by using the many activities (Thomas, 2006) such as modify the child's environment, internet counseling, nutritional education, healthy diet promotion, physical activity promotion, primary prevention program for family, coping strategies, and class room curriculum (Weigel et al., 2008; Williamson, 2008). The workshops, interdisciplinary curriculum, and peer support groups. The increase physical activity improves dietary behaviors and modifies poor exercise or dietary behaviors (Gonzalez-Suarez, Worley, Grimmer-Somers, & Dones, 2009). Inclusion, the merging of the four parameters such as dietary and physical activity changes, behavior modification by parental, and school support for childhood obesity (Spear, 2007).

2.3. Obesity prevention or control program of children in Thailand

The review literature about obesity prevention or control program in the previous time of Thailand can represent as follows:

The most of studies have focused on established the program for obesity prevention in children by using the nutrition and physical activity program in school such as instruction media, computer assisted instruction (CAI), workshop, education program, camp's activities and counseling. Few researches have studied the existing data from obesity control program in diamond levels health promoting school and develop the obesity control program in example school. The researches represent as below table 2-1.

Table 2-1 Obesity prevention or control program of children in Thailand

Researchers	Title/Participant/ Time of study	Strategies/Activities	Outcome
Pongpitak et al., 2009.	The development of Obesity Control Model in Elementary School Students, Phetchabune Province. -872 samples composed of responsibility in the elementary school (grade 1-6, aged 6-12 years old). - 7 weeks	1) Workshop was 2 curriculums for 2 days of training. 2) Parents and teacher prepared menu and sufficient food; organized good exercise at home and schools. 3) The students performed those activities and recorded the information of nutrition and exercise at home and school.	-The attitude, behavior toward exercise, and nutrition after implementation was higher than before at p-value < 0.01. -Student's weight over 3 months reduced at 31.43% from nutrition and exercise. -The satisfaction of the model was at the medium level ($\overline{X}$ =2.34).

Table 2-1 Obesity prevention or control program of children in Thailand (cont.)

Researchers	Title/Participant/ Time of study	Strategies/Activities	Outcome
Manora et al., (2010).	Nutrition program for caretakers of obese preschool children Bangkok metropolis. -The experimental group with 34 caretakers and the 41 caretakers for comparison group -3 months	-The program applied Health Protection Motivation Theory and participatory learning. -The participants of the active intervention group joined 3 months, composed of modules for nutritional education.	-The experimental group had significantly higher mean score of knowledge, perceived severity, vulnerability, attitude, response efficacy and selected food behavior than the comparison group (p-value < 0.001).
Sirikulchaya-nonta et al., (2010).	Participatory Action Project in reducing childhood obesity in Thai primary school - 5,126 children (grade 1-6, aged 6-12 years old) from4 Bangkok public schools -8 months	-A strategic planning workshop by school directors, teachers, and parents. -Basic training course by expert lectures included child nutritional assessment, exercise and health, weight management. -The integration of the course contents into course curriculum. (4 months)	-The caloric dietary intake significantly decreased for the obese group (p-value <0.001). -Aerobic exercise activity also increased in both groups (p-value <0.001). - Prevalence of obesity declined from 19.3% to 16.8%.

Table 2-1 Obesity prevention or control program of children in Thailand (cont.)

Researchers	Title/Participant/ Time of study	Strategies/ Activities	Outcome
Tanwattana, (2007).	Effectiveness of health education program in modifying eating behavior of students who are overweight -The obese children grad 5-6 in Bangkok. -The 27 experimental group and 32comparison group persons. -5 weeks for activities and 4 weeks for follow up.	- The activities organized were lectures with the use of flipcharts, self-nutritional status assessment, group discussion, games, and food preparation practices.	-The experimental group had significantly higher knowledge of nutrition than before the program and the comparison group (p-value < 0.05). -The study suggests that school policy should be established for health promotion behaviors -Knowledge about healthy diets should also be integrated in curriculum.
Chokprajak-chad, (2009).	The effectiveness of a weight management program using the camp technique for obese school children - The samples were 9-12 years obese children (weight for height >2SD). - The 43 students for intervention group and 50 students for control group. -2 days for camp's activities.	- The camp's activities were designed for weight management such as eating and physical activity behavior improvement.	-After camp, the intervention group had a significantly better eating behavior and knowledge score than the control group (p-value <0.05). -The weight, waist circumference and physical activity did not show difference. The camp technique can improve knowledge and eating behavior.

Table 2-1 Obesity prevention or control program of children in Thailand (cont.)

Researchers	Title/Participant/ Time of study	Strategies/ Activities	Outcome
Sariganont, (2008).	Development of instruction media for behavior modification related to weight management among 4 grade -The participants were grade 4 students in 2 private schools. -The 241 students for experimental group and 177 students for the comparison group -7 weeks for media.	-Modify the instruction media 7 sessions by teachers. -50 minutes for each session (1 session/week)	-The experimental group increased significantly of mean scores over the pre-test scores, including the knowledge part (p-value < 0.05). -The modified instruction media and guidelines by teachers were useful in weight management of schoolchildren.
Banchonhatta kit, (2008).	Effects of school-social network on childhood obesity prevention (SNOCOP) in primary school. - The experiment group, 180 students, 6 schools and comparison group, 195 students, different 6 schools. -10 months	-The SNOCOP process was conducted from school policy and school activities. -The social contacts and social ties was enhanced the social support activities.	-The experimental group had a significant improvement in knowledge, attitude, and intention towards obesity preventive behavior. -The experimental school showed an improvement in the school policy development process and school activities.

Table 2-1 Obesity prevention or control program of children in Thailand (cont.)

Researchers	Title/Participant/ Time of study	Strategies/ Activities	Outcome
Thepprasit, (2009).	The effectiveness of Computer-Assisted instruction "Fun with nutrition" for prevention of childhood obesity. - 134 students in the intervention group and 113 students in the control group. -9 months	- A computer-assisted instruction (CAI) package entitled "Fun with Nutrition". -The intervention was done weekly in the form of a 40-50 minute class for 5 weeks.	-The intervention group increased their knowledge after using CAI more than students in the control group. -This program can enhance learning achievement in students regarding childhood obesity and nutrition knowledge.
Sangthien, (2006).	The effectiveness of the nutrition counseling intervention on weight control program in obese school-aged children. -The 23 students for intervention group and 22 students for control group. -6 months	-The counseling intervention included a behavior modification technique on a weight control/reduction program in obese school-aged children.	-The reduction of weight-for-height Z-scores in the counseling group was significantly greater than in the education group when compared at all points from baseline of the study (p-value < 0.05). -The counseling group had lower mean energy intake at 12 and 24 weeks of the study than at baseline (p-value < 0.05).

2.4 Gaps in the study of childhood overweight in Thailand

The overweight and obesity in children problem that is the public health problem, it is a challenge for public health nurses to create further research on strategies for overweight obesity prevention, in elementary school students.

The various studies related to the created the program for obesity prevention in children by using the nutrition and physical activity program in school but the results of the study do not sustainable. In order to overcome this limitation and receive the best obesity control program, the researcher combine the process of National policy or Health promoting school strategies, review literature from the successful study and the collaboration of participants in school for resolving this problem in overweight and obese students in elementary school.

The output and the outcome variables in this study is children's perception in their obesity, parent's perception of obesity in their child, children's and parent's consumption behavior, children's and parent's physical activities and exercise behavior, and body fat percentage of children.

Part 3: The National Policy for Obesity in School

School is a center of children in the same community. The idea of developing a school as the learning center has been encouraged by several organizations and countries. The World Health Organization (WHO) advocates positive health practices in schools believing that a child's development should be wholesome to include both their education and physical health. This program is called "School for Health" which is expected that the school will be the healthy and sanitary place for good education and work. It will be the platform to developing healthy behavior among children and serve as a center for behavioral change. This will also translate to improving the general health of the children's families and communities (WHO, 1998; cited in Ministry of Public Health, 2003).

Schools are a critical part of the social environment that shape children's eating and physical activity patterns. Health of children has long been a realization of the public, and history is replete with individual and group attempt to improve their lot. The teachers, nurses, parents and students in each school should be expected to

identify health problems and recommend solutions to these problems. It is the health of children that is the concern of the school's health program, and children themselves are the object of all health activity (Creswell, 1980).

Health Promoting School

The health promoting school in Thailand is launched health promoting school project in 2003 by Department of Health, Ministry of Public Health. The concept of this study was to promotion of health and well-being of student by collaboration with the local community and engagement of parents or families to project and participation of student by using empowerment. The health promoting school project composes of 10 components for implement and assessment including:

1) School policy; school has to establish team, structure, and administration for goal achievement of education. Assignment in health promoting policy and supporting the activity from health policy to actual activities are the main activity in this component. Moreover, establishment committees for supporting the health promoting school come from teachers, students, parents, health service authorities, and community representative.

2) Management in school, school has to manage the organization and system of school for goal achievement of education. Health promoting school project, monitoring, and evaluation of program are the activities for management in school. Responsible persons and representative students are key persons for this component.

3) Collaboration project of school and community, school has to build the relationship and cooperate with community. The criteria in this component include the health project in school that come from the cooperation between school and community, community has to participate in step of analyze the situation, planning, implementation, evaluation, and following and adjustment. The end of program, students and community satisfy in health program.

4) Creating environments supportive to health, school has to set the healthy environment in school. The criteria in this component include sanitary and healthy environment in school for reducing the accident and dengue fever in school.

5) School health service, the aim in this component are creating the health habit, physical and mental health in students. The criteria in this component included health checking, monitoring in health status, and health service for students in school.

6) Health education in school, students has to receive the knowledge of body and hand cleansing, healthy food choosing, toxic and acrostic avoidance. Moreover, school has to health activity such as knowledge document, exhibition, and brush teeth after school lunch meal.

7) Nutrition and safety food in school, physical and mental health in students, students have the normal nutritional status, healthy food and 5 food components consumption. Milk consumption in elementary student grade 1 to 6, and ferrous supplementation in students are the criteria in this component. Moreover, teachers teach the healthy food knowledge to students and ban the candy, soft drink, and snack in school.

8) Exercise sports and recreation, school has to establish healthy place or stadium and sport equipments for students and people in school and community. Students have to physical fitness assessment for one time/semester. All students have to pass the criteria of physical fitness. Students who do not pass physical fitness are monitor until they can pass.

9) Providing counseling and social support, teachers have to screen and follow the students who have the problem. They will receive the information for solving problems from teachers. Teachers and parents can help students for solving problems.

10) Health promotion for staff in schools, teachers and workers in school have to health assessment one time/ year. All workers receive the healthy knowledge for one time/week. Smokings in school and alcohol beverage are prohibited in school. Moreover, all parties have to cooperate in healthy activity in school.

According to these criteria, most schools have participated in the project for development their school to health promoting school. The criteria of school that passed the health promoting school can separate to 3 levels as 1) gold level (passed more than or equal 8 criteria), silver level (passed more than or equal 6 criteria) and 3) copper level (passed more than or equal 4 criteria) (Department of Health, 2005).

In 2008, Department of Health, Ministry of Public Health considered that should be enhance the criteria of health promoting school to diamond level for focusing on health measuring and health behaviors of students for according to policies of the Ministry of Education.

In 2010, 60 health promoting schools were diamond level and had sustainable activities for leading to the promotion of food and nutrition in their school by these schools must to pass the 3 criteria and 19 indicators and pass the criteria of goal level of health promoting schools.

DLHPS has health criteria such as sustainable health activities/project in school, weight and high in normal linear growth, and strong nutrition policy for obesity prevention in school (Department of Health, 2005).

In the other countries, Health promoting school has the many activities such as Banning high fat, sugar food and beverages advertising via television in Australia (Magnus et al., 2009). National School Lunch Program, School Breakfast Program serve meals according to federal nutrition guidelines, Healthy Eating, Active Communities (HEAC) and Healthy mobile vending policies in California (Tester, Stevens, Yen, & Laraia, 2010; Woodward-Lopez et al., 2010). And the nationwide free school fruits scheme in Norway (Bere et al., 2010). Most strategies were done to prevent or reduce childhood obesity. The successful strategies can display in decreasing trend of childhood overweight and obesity prevalence in Australia and France (Olds, Tomkinson, Ferrar, & Maher, 2010; Peneau et al., 2009) and increasing the personal skill building, parental involvement, staff family relationships and school-community connection, and health policies in China (Wong et al., 2009). The involvement of school food service programs by including the healthy lifestyle education supported by parent was influencing dietary habits at school (Wanda & Kridli, 2009).

From the research of Peungposop, Wongboonsin, & Kost, (2011) studied schemes and barriers relating to childhood overnutrition control in Thailand. The results found that health education and law enforcement may be the most favorable strategies to prevent childhood overnutrition. However, reduction of childhood overnutrition has been unsuccessful due to the lack of a national agenda on childhood overnutrition, inadequate funding, poor quality nutritionists and health personnel, and

poor coorperation from families, schools, and the food industry. Appropriate childhood overnutrition control should focus on proactive strategies, us engineering of physical facilities and technological resources strategies, and health education strategies.

The 2009 Prince Mahidol Award International Conference which was held during 29-30 January 2009 brought along leading public health leaders and stakeholders from around the world to discuss high priority on global health issues and in particular an issue on diets and public health, including summarizing findings and proposing concrete solutions. A food and nutrition policy which addressed both individual (such as knowledge about healthy eating behaviors and lifestyles) and environmental factors (such as schools, food stores and restaurants, and media and food advertisement) influencing unhealthy diet behaviors of Thai people, was strongly recommended. Together, a need for greater collaboration, particularly between the government and private sector, cutting through different levels of community, region, and national was also recommended to help tackle health and nutrition problems (Phulkerd, Pongutta, Thamarengsi, & Patcharanarumol, 2011). However, participation of all parties was the main factors for obesity control solving (Nuchanon, 2003).

Participation

Participation is used with a human object who gathering together, mobilizing, rallying, concentration, even uniting of people with a common purpose, joining forces, to form a group (Hirsch, 1990). Participation increases motivation, flexibility, and time needed to learn (Stanhope & Lancaster, 2010). Advantages of participatory management include teamwork, improved organizational communication and quality of work, increased effectiveness and productivity (Roussel, Swansburge, & Swansburg, 2006).

Cohen and Uphoff (1979) said that the participation means a process of making decision, process and develop activity as settled project, sharing benefit obtained from performance, follow up, and evaluate the project. There suggested that there are many kinds of participation they have focused on four that seem to be most important as 1) participation in decision making, 2) participation in implementation, 3) participation in benefits, and 4) participation in evaluation.

In addition, they still presented the relationship of participation model as shown in Figure 2-4. This figure was started in (1) decision making that showed the relation line or dense line (——). Decision making will has effect to implementation and from implementation it will effect to benefits and evaluation. Meanwhile decision making will has direct effect to benefits and evaluation as shown from dense line, at the same time implementation and evaluation will have feedback to decision making which shown by sprinkle line (- -).

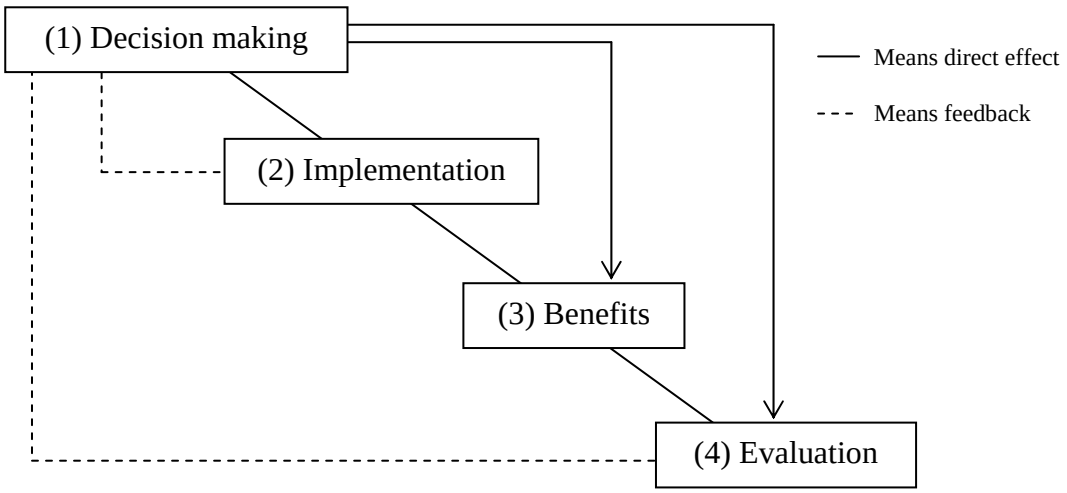

Figure 2-4 : The relationship of type of participation
Data from: Uphoff, N.T., Cohen, M.J., & Goldsmith, A.A. (1979). *Feasibility and application of rural development participation: A state-of the art paper rural development committee center for intentioned studies.* USA. Cornell University, 286-338.

For the participation in school, several persons could participate in the obesity control program such as school or teachers (they could establish the healthy activity and bring the National school program to their students) students (they cooperated in program) (Gleason & Dodd, 2009; Ohri-Vachaspati, Turner, & Chaloupka, 2012; Whittemore et al., 2013) clinicians or nutritionist (they created the program and motivated the participants to obesity treatment program) (Ohri-Vachaspati, Turner, & Chaloupka, 2013; Skelton, Irby, Beech, & Rhodes, 2012) nurse (they could coordinate between school and family) (Wright, Giger, Norris, & Suro,

2012). Moreover, family and community could support the obesity intervention such as family (they could perform the health activities with children in their home and build relationship between children and parents) (Mager & Nowak, 2012) community (they could promote physical activity for children after school) (London & Gurantz, 2013). Therefore, the participation helped to concerned with benefits and challenges of the collaboration in all participants (Mfum-Mensah, 2011).

Part 4: The Embedded research design

The Embedded design is a mixed methods design that combines quantitative and qualitative research. The Embedded design is one data set that provides a supportive the other data types. This design gathers the both of qualitative and quantitative data to reply a research question, to develop a program, treatment, or intervention to examine the experimental results (Creswell, Plano Clark, Gutmann, & Hanson, 2003).

4.1 Embedded design procedures

4.1.1 Embedded design: The Embedded design combines the different data sets at the first design level and one data set is within a methodology framed in the other data type as showed in A or B pattern (Figure 2-5).

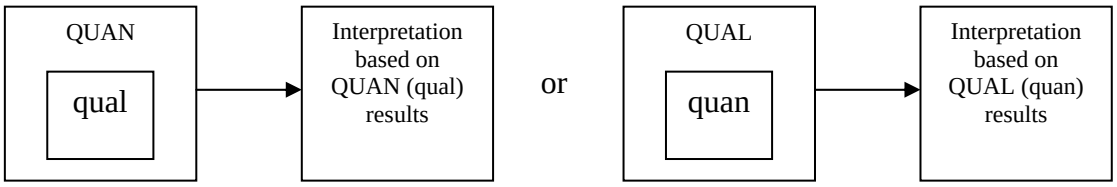

Figure 2-5: Embedded design

4.1.2 Embedded correlational model: This model come from concurrent nested mixed methods design. Two-phase model has the qualitative data before or after the intervention. The researcher can order the sequential approaches of qualitative data to explain the intervention results and follow up the outcome of the experiences of participants. The correlational model as showed in Figure 2-6.

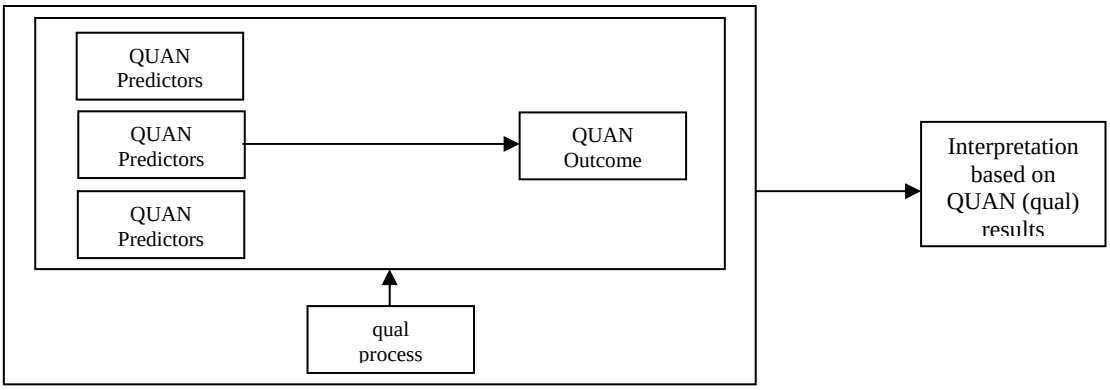

Figure 2-6: Embedded Design: Embedded Correlational Model

4.1.3 Embedded Experimental Model: The Embedded experimental research design combines the both quantitative and qualitative data by one of the data types within the overall design. The initial of this model is created by qualitative data that can be embedded during the intervention phase and test or examine by qualitative process of the intervention for receiving the quantitative outcomes as Figure 2-7.

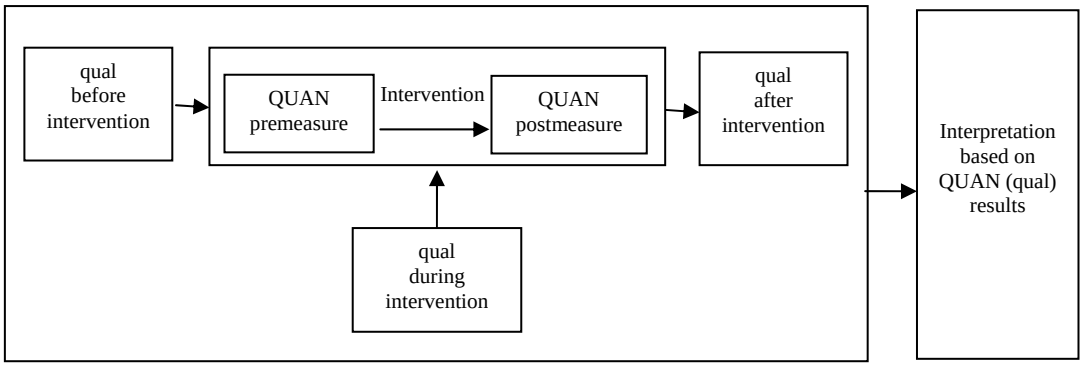

Figure 2-7: Embedded design: Embedded Experimental Model

4.2 Strengths of the embedded design

This embedded design approach to multi-strategy research occurs when the researcher cannot rely on either a quantitative or a qualitative method alone and must buttress his or her findings with a method drawn from the other research strategy. Employing multi-strategy research may dilute the research effort in any area, since resources would need to be spread (Bryman, 2004). The advantages specific to this

design for the data do not have sufficient time or resources to extensive quantitative and qualitative data collection because one data type is given less priority than the other. The researchers must specify the objective of collecting qualitative or quantitative and they should decide the plan of study process before intervention approaches and specify the criteria used to select the participants for the follow up data collection (Creswell, Plano Clark, Gutmann, & Hanson, 2003).

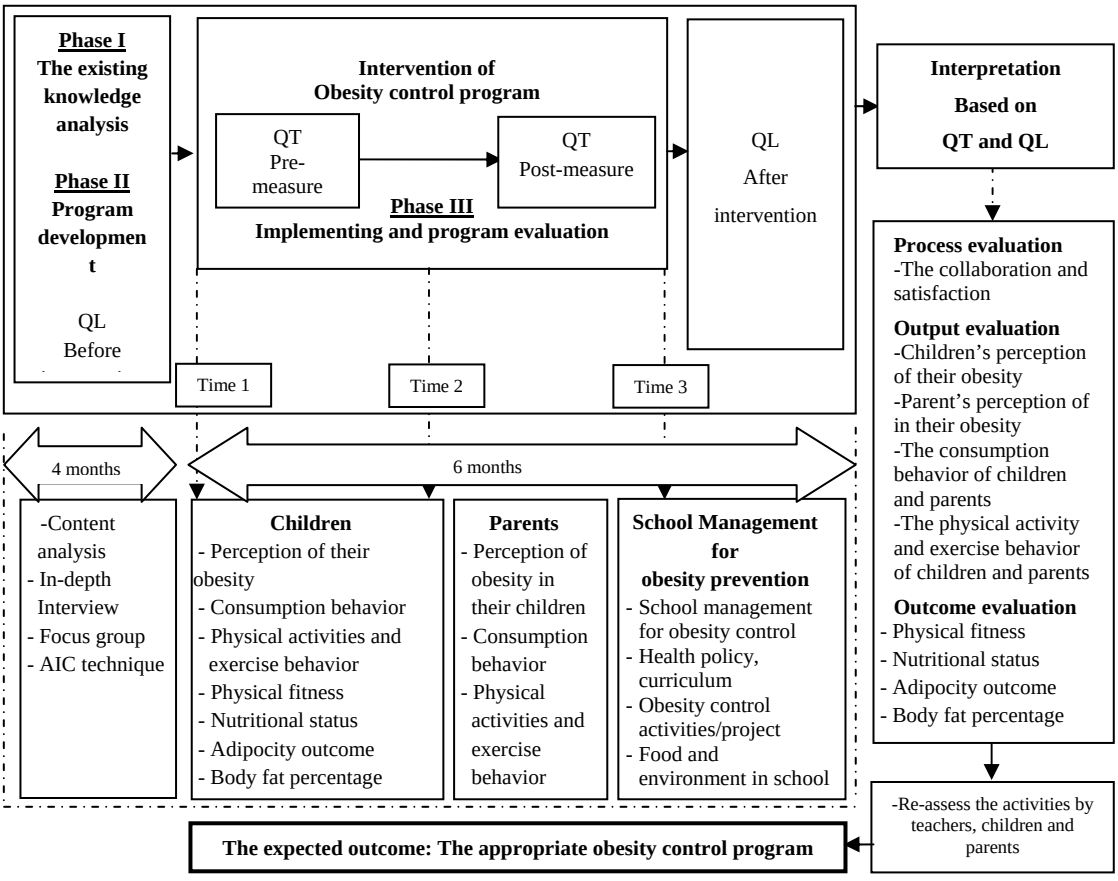

Figure 2-8 The research conceptual framework (Embedded experimental research design), (Creswell, Plano Clark, Gutmann, & Hanson, 2003).

According to aforementioned, this study, the researcher selects the embedded experimental research design as Figure 2-8. This study combines the both quantitative and qualitative data by start the qualitative method in phase I and phase II for exploring and analysis the process and activities of obesity control program in diamond levels health promoting school. The next process is phase III for intervention

of obesity control program development. This phase has pre and post measure for explain the treatment results of obesity control program. The repeated measure of dependent variables is assessed in this phase. During and after intervention has assess the results of the obesity control program by using qualitative method. The final results of this study are interpreted by the both quantitative and qualitative method and re-assess the activities by participants. The expected outcome is the appropriate obesity control program.

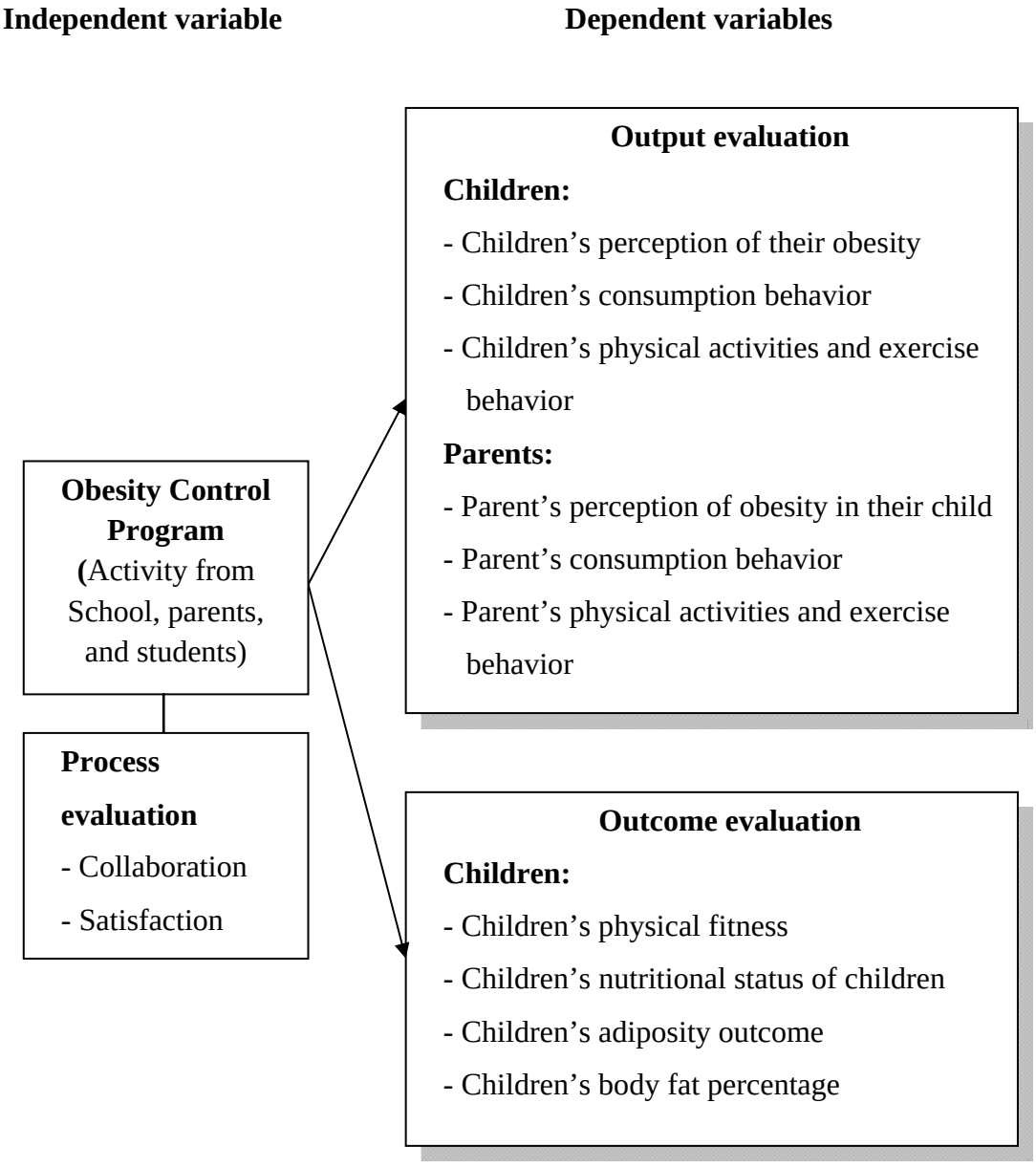

Figure 2-9 Conceptual Framework

CHAPTER III
METHODOLOGY

This chapter presents the research design and methods organized in each phase for development of the obesity control program in elementary school students as follows:

1. Research design
2. Research setting and participants
3. Research procedure and Data collection
4. Research instruments
5. Data analysis
6. Protection of Human Subjects

The design of this study based on mixed method design; embedded experimental research design. The study consisted of three phases including 1) one months in the existing knowledge analysis phase, 2) three months for the program development phase, and 3) six months for implementing and program evaluation phase (10 months totally). This design was briefly present as shown in Figure 3-1.

Phase I: Existing knowledge analysis

1. Research design

The design of this phase used qualitative method for study the lesson learned, to design, analyze strategies, and means of activities of the obesity control program from the DLHPS.

2. Research setting and participants

The research settings in this phase were 4 DLHPSs according to criteria as follows:

1) School A, Bangkok metropolitan
2) School B, Samutprakarn Province
3) School C, Ayutthaya Province
4) School D, Chonburi Province

In each school, the number of participants in this phase as follows: One school director, two teachers who had responsibility in obesity control program, students participated in obesity control program, and two food cookers in cafeteria.

3. Research procedure and Data collection

The researcher separate for 3 steps as follows:

Step I: Selecting the DLHPS

The researcher selected the example schools that outstanding of obesity control in school. The result of implementation in DLHPS year 2010 report according to criteria as follows: 1) School locates in central part of Thailand, Regional health promotion center 1-4, 2) School has sustainable of the obesity control project in school at least 3 years, 3) School has the participation in obesity control project that is students, teachers, parents, and community, 4) School has decreasing prevalence of overweigh and obese students by less than or equal 7% of total student in school (according to DLHPS criteria), 5) Integration in health education, physical activity subject and other subjects at least 1 subject, and 6) Willing to participate.

Step II: Contact the school

The researcher contact the schools that had the criteria as assignment and the selecting school should be willing participate.

Step III: Collecting data

Data of selecting DLHPS was collected by using qualitative methods. These methods include document analysis, in-depth interview, and focus group discussion as follows:

1) Document analysis

The researcher performed the document analysis at the first time for study the initial data of obesity control program in DLHPS. Document analysis came from the schools and the Ministry of Public Health. The primary study of obesity control program in school received from the assessment of DLHPS report of Nutrition Division, Department of Health, Ministry of Public Health. The secondary study of obesity control program in 4 DLHPSs was studied from the health assessment document and health project report of school.

2) In-depth interview

The objective of in-depth interview was to study the processes of the obesity control program or project development. These methods include in-depth interview in school directors, teachers who were responsibility in obesity control program and food cookers in cafeteria. All data were recorded by audiotape recording. Each session lasted approximately 45 minutes. In-depth interview guidelines consisted of open-end question that focused on the processes of the obesity control program or project development, the result, success factor, lessons learned, problems and barriers, and dreams for the future. The issues of trustworthiness of the study were discussed in terms of the criteria suggested by Lincoln and Guba (1985): credibility, dependability, transferability, and conformability. The instruments of this method were audio recorder and note paper.

3) Focus Group

The researcher performed interview among the students group who were participant in obesity control program in order to increase understanding of the process and activities of obesity control program in school. The focus group interview used open-ended questions format. The audiotape recording was the instrument and the period of time about 45 minutes. The focus group consisted of five to ten participants with open-ended questions and focused on the activities in obesity control program that the students like and succeed in weight reduction. The instruments of this method were audio recorder, microphone name tents, marking pens, flipchart, and note paper.

The important step of focus group included as follows:

-Arrange chairs and table so everyone can see each other

-Take notes throughout the discussion by capture word for word

-Listen for sentences or phrases and place quotation marks around the statement or phrase by indicate name of speaker

-Make a sketch of the seating arrangement

-Do not participate in the discussion by control nonverbal actions

-Brief summary content about 2 minutes of responses to the important questions at the end of the discussion

-Invite participants for corrections in summary content

-Provide feedback on analysis (Krueger & Casey, 2000)

4. Data Analysis

The in-depth interview and focus groups were transcribed by verbatim from audiotape for extract the contents.

Focus group

For the focus group, "Long Table Approach" of Krueger and Casey (2000) was applied in data analysis of focus group. The instruments were used for this method including a wild room with long table or wild the floor space, scissors, colored marking pens, colored paper for copying the transcripts. First step do the transcripts apart according to the questions. Write one of the focus group questions to be analyzed on the page of colored paper. In this study, the 3 questions have divided in 3 parts or page of colored paper. Read each quote and answer and put it on the page of colored paper. Write the resource of answer by colored marking pens. Rearrangement for new categories had occurred when data had new information of answer until proper the categories. Write a descriptive summary of what each type of group said in response to the questions. Then write a summary for each question. The next step was comparing and contrasting. The final step was conclusion by weighting and emphasizing to give comments or themes by consideration from frequency or the importance of content,

specificity in the detail, emotion of participants when their answer, and extensiveness. The report of contents from focus group was item.

In-depth interview

For the in-depth interview used the process of content analysis that composes of preparing data, coding data, integrating data and conclusion data as follows: (Zhang & Wildemuth, 1996).

Step 1: Prepare the data

The data were transcribed verbatim from tape recording of the in-depth interview.

Step 2: Define the unit of analysis

The analysis unit referred to the basic unit of text to be classified during content analysis. All unimportant words will be deleted in order to understand the statements and transforming the sentences into a short form. A code assigned to a text chunk of any size in relevance with research question.

Step 3: Develop categories and a coding scheme

Categories and a coding scheme derived from the data, previous related studies, and theories.

Step 4: Test the coding scheme on a sample of text

The validation of coding scheme was developed in the early of the process. The best test of the consistency and clarity of category definitions was coding a data sample.

Step 5: Code all the text

When sufficient consistency has been achieved, the coding rules can be applied to the entire corpus of text.

Step 6: Assess the coding consistency

After coding the entire data set, had to recheck the consistency of coding.

Step 7: Draw conclusions from the coded data

This step involved making sense of the themes or categories identified, and their properties. The activities were involved exploring the properties and dimensions of categories, identifying relationships between categories, and testing categories against the full range of data.

Step 8: Report methods and findings

For the study to be replicable, monitor and report the analytical procedures and processes as completely and truthfully as possible. From the coded statements of all interviewees can interpretation. This step, the researcher was able to extract the contents and display the results.

5. The expected outcome

The expected outcome of this phase was the obesity control program from the DLHPS

Phase II: Program development

This phase was separated for 3 steps that was 1) Identifying program, 2) Planning Program, and 3) Program validity by interpretation as follows:

1. Research design

The phase of program development was aimed at developing obesity control program for childhood overweight base on qualitative data of DLHPS which were the best practice in obesity control program.

2. Research Setting and participants

In this phase focused on one school which did not get health promoting school and did not receive the highest health promoting award or diamond level, but

this school had the obesity problem in children and willing to participate for obesity control program development. The school was Christasongkroc School. For this part would describe in 2 steps as follows:

Step I: Identifying program

In this step studied and synthesized the process to create the appropriate new obesity control program for prevention childhood overweight in the selected schools or Christasongkroc School by the researcher. The step of preparing, coding, integrating, and conclusion data was performed in this step. The data received from each DLHPS were described and transferred to the DLHPS for performing accuracy. Integrative review from previous studies was combined in this obesity control program.

Step II: Planning Program

Research setting in this step was Christasongkroc School. The program planning was created by the participants in this school in order to set the activities of obesity control program by themselves. The participants in this study from Christasongkroc School were students, teachers, and parents. They were invited for adjusting the activities of obesity control program by conclusion from DLHPS and previous studies. Collaboration was emphasized on this study.

Population

The populations of this step were the teachers who responsible the student grade 1-3 in each room and school health teacher. The students in this phase were overweight and obesity students grade 1-3 elementary school students and their parents. From the statistic of health report in 2011of Christasongkroc School found that the number of students was 67 and parents were 23 persons, totally 90 persons. The number of teachers was 9 persons.

3. Research procedure and data collection

This phase, the data from obesity control program in DLHPS were analyzed and proved by participants of Christasongkroc School. The specialists in the

final adjusted and received the appropriate obesity control program. This phase was separated for 3 steps as follows:

Step I: Identifying program

The data from in-depth interview including the school directors, teachers, food cookers, and focus group with children of each school were translated by verbatim. The process of in-depth interview composed of preparing data, coding data, integrating data and conclusion data by the same as the contents analysis method (Zhang & Wildemuth, 1996). The process of focus group used the "Long Table Approach" of Krueger and Casey (2000). These data were analyzed by the researcher. The next step of conclusion data was feedback all information to DLHPS in order to confirm information accuracy. After completing the obesity control program from DLHPS, the activities of obesity control program were combined with literature review as follows:

The integrative review from previous study: The databases PubMed and CINAHL were used in this step. The keywords of "obesity", "overweight", "children", "school", "intervention" or "program" were selected. Inclusion criteria for this review were: (1) English-language publication; (2) a research article evaluating form of intervention strategy for prevention or treatment of childhood overweight or obesity; and (3) publications between 2005 and 2012. Exclusion criteria were articles in languages other than English, review articles and case studies.

The contents of obesity control program were combined between 4 DLHPS and literature review for completing data.

Step II: Planning program

The aim of this step was create awareness, collaboration among participant group and set activity for obesity prevention in children by using the obesity control program that based on DLHPS and the review literature of success obesity control program from the previous studies.

The group in this step separated into 3 groups as follows:

1) Students who were overweight and obesity student grade 1-3.

2) Teachers who were responsibility in school health issue in school, director of school, and elementary teacher grade 1-3.

3) Parents who had overweight and obese children.

The step of program planning in each group was activity in one day workshop that increased participants understanding of childhood obesity problem. Four main activities were done as 1) Group meeting 2) Identify problems and factor of obesity in children 3) A-I-C technique and 4) Information and integration session.

The first step was group meeting for identify problems and factor of obesity in children, A-I-C technique and rising awareness by create nutrition education session. The management of program planning focused on goals setting and set of activity by collaboration with participants. The detail of activities was described as follows: (Smith, 1991).

1) Group meeting: All participants in each group meet in small group and freely discuss the situation of childhood obesity problem in school from the researcher and share their ideas about childhood obesity problem.

2) Identify problems and factor of obesity in children. The prioritize childhood obesity risk factors.

3) The A-I-C technique consisted of six activities:

Step 1: Appreciation; sharing ideas and discussing

A1 Reality: Identifying their child's body shape

A2 Ideal vision: Draw their child's body shapes in the future

Step 2: Influence; identify the best development activities or project and set their own development priorities.

I-1 Solution design: Creating activities according to their idea

I-2 Prioritization: Prioritization of the project

Step 3: Control; action plan setting flam and responsibility

C-1 Action plan: Preparation of the implementation plan

C-2 Responsibility: Identification of the responsible persons who implement the plan.

A-I-C technique method was a process that helped to recognize the centrality of power relationships in development projects and encourage stakeholders to create the activities of project.

In step I, participants could identify and present current situation, risk factors and problems of childhood obesity. Students drew their actual body shape and they wish in the future. They identified the best development activities and participants and responsible person according to their idea. All participants wanted to see the normal body shape of their children in the future.

In step II, they could adjust the activities from DLHPS and previous study to their school. Therefore, these activities were appropriation with the context of social and environmental school. The A-I-C technique appropriated with program development process because the expected outcome in this phase was the obesity control program that fit with their context.

In final or Step 3, participant could collaborate for creation and conduction the obesity control activities in their school and home. Moreover, they could offer the responsible persons who implement the obesity control activities.

4) Information and integration session brought from the information of obesity control program of DLHPS from phase 2 (step 1) to group participants. The of obesity control activities from A-I-C technique integrated with obesity control program from DLHPS and the review literature of successful obesity control program from the previous study by participants. The obesity control activities were applied by participants who can adjust the program for appropriation with the context of social and environmental school.

Therefore, the obesity control program was applied by the 3 resources. The first was DLHPS. The second was review literature and the final resource was participants in selected school or Christasongkroc School.

Step III: Program validity

Obesity control program was examined by 3 specialists from 1) Department of Nutrition, Faculty of Public health, Mahidol University, 2) Institute of Nutrition, Mahidol University, and 3) Health education Division, Department of Physical education, Srinakharinwirot University.

For the questionnaire of obesity control program was checked by the specialist for suitable program. This program was proved by 5 specialists from 1) Nutrition Division, Department of Health, Ministry of Public Health, 2) Bureau of Sport Science, Department of Physical Education, Ministry of Tourism and Sports, 3) Department of Nutrition, Faculty of Public health, Mahidol University, 4) Department of Physiology, Faculty of Science, Mahidol University, and 5) Institute for population and social research, Mahidol University.

4. Research Instruments

In this phase of conclusion data that came from the process of content analysis guideline and A-I-C technique guideline by the researcher.

5. Data Analysis

This phase the research brought the data from phase I (step 3) to analyze in phase II (step 1). The researcher used Qualitative data analysis from content analysis, in-depth interview, focus group by using tape records of interviews were transcribed verbatim for extract the contents.

6. The expected outcome

The outcome of this step was the appropriation of obesity control program such as activities of obesity program and manual of nutrition education for students, parents, and food cookers.

The manual of obesity control program and questionnaires from specialists that was ready to use in the next step or phase III Implementing and evaluation program.

Phase III: Implementing and Program Evaluation

1. Research design

This phase was quasi- experimental study to examination and evaluating obesity control program for checking effectiveness and efficiency of program in a sample school and control school. This phase composed of two steps as 1) implementation, and 2) program evaluation. The program evaluation was separated for 3 steps as process evaluation, output evaluation and outcome evaluation.

2. Research Setting and participants

Students:

Christasongkroc School was selected by researcher for experimental school and Malasawanpittaya School was control school because it had the appropriate criteria.

Sample size

The sample size in this phase calculated from the power analysis. The power analysis helped estimating either the likelihood of committing a Type II error or sample size requirements (Polit & Beck, 2006). The power analysis represents a method for reducing the risk of Type II errors. In performing a power analysis, there are four components, at least three of which must be known to or estimated by the researcher; power analysis solves for the fourth component. The four majors are as follows: (Polit & Hungler, 1987).

n = The sample size

r = The difference between the population means, divided by the population standard deviation = 0.80

From the equation of $r = \frac{\overline{X}_1 - \overline{X}_2}{SD} = 0.80$

$\overline{X}_1$ = The means of the perceived benefits of dietary in intervention group = 48.96

$\overline{X}_2$ = The means of the perceived benefits of dietary in control group=48.56

SD = The sample standard deviation = 0.5

From the study of Health Schools-Healthy Kids: A controlled evaluation of a comprehensive universal eating disorder prevention program (Tanwattana, 2007).

1-β = Power or the probability of rejecting the null hypothesis, when β is the probability of Type II errors (wrongly accepting a *false* null hypothesis) = 0.80

α = Type I errors (wrongly rejecting a *true* null hypothesis) =0.05

From the samples size requirements table, the α of 0.05 and power of 0.80, the sample sizes needed in this study are 25 subjects per group.

Therefore, the sample sizes of overweight and obesity students in 1-3 elementary were 25 personals. However, the sample sizes of this study were increased about 10% to be 28 personals per group to allow for any possibly uncompleted responses.

In this case, the every overweight student and their parents in school were willing to participate. Therefore, the sample size involved the program by more than the calculation of sample size that was 40 persons in experimental group and 44 persons in control group including their parents.

For the control group, the researcher selected the students in Malasawanpittaya School because this school had the same as criteria of Christasongkroc School such as gender age and nutritional status.

The obese children was measured their weight by weight scale balance and their high by tape measure. Child nutritional status was categorized using the standard gender specific growth chart weight-for-height ratio for Thai reference 1 day-19 years of age, Ministry of Public Health (MOPH, 1999).

Teachers:

Eight teachers who participated in this group came from teacher of main subject who taught in grade 1-3 including the 1) Mathematics, 2) Thai language, 3) English language, 4) Arts, 5) Social, 6) Science, 7) Health education and physical, and 8) Home working and technology. And one teacher who participated in this group was school health teacher. Totally of teacher in group meeting was 9 persons.

3. Research procedure and data collection

The experimental school was performed the obesity control program that difference from the control school because this school did not receive the any program. The data collection in this part focused on the experimental school as follows:

Step I: Implementation

The process of program was adjusted from the DLHPS, the literature review of successful obesity control program from the previous study, and the collaboration with students, parents, and teachers in selected school. The activities of obesity control program had eight activities as follows:

1. Nutrition education for students, parents and food cookers
2. Healthy food for students
3. Teachers meeting for integrative the nutrition contents to all subjects
4. Nutrition physical activity, perceptions and physical fitness assessment
5. Plant the vegetables at home
6. Healthy day/ healthy corner
7. Newsletter for parents
8. Exercise in the morning for students

Step II: Program evaluation

In this phase, the program evaluation of obesity control program in the experimental and control school was 3 times; 1) before program intervention (Time 1), during program intervention (Time 2), and immediately after program intervention (Time 3).

The outcomes of program evaluation were as follows:

Output evaluation

- The perception of obesity, consumption behavior, physical activities/exercise behavior in children and parents.

Outcome evaluation

- The physical fitness, nutritional status, adiposity outcome, and body fat percentage in children

4. Research Instruments

4.1 The questionnaire of general characteristic data of children and parents

For children: This part consisted date of birth, education, weight and height and the thinking of their shape.

For parents: This part consisted of the relationship between student and parent, age, weight and height, education and occupation.

4.2 The questionnaire of the perception of obesity in children and parents

The perceived health status questionnaire was translated from General Health Perception Battery (Brook et al., 1979). This questionnaire consisted of 6 dimensions, which were prior health, current health, health outlook, resistance and susceptibility to illness, health worry and concern, and sickness orientation. The total of 6 items and 12 items in children and parents were included in the questionnaire as follows:

Items	Children	Parents
Prior health	1 item	2 items
Current health	1 item	2 items
Health outlook	1 item	2 items
Resistance and susceptibility to illness	1 item	2 items
Health worry and concern	1 item	2 items
Sickness orientation	1 item	2 items

The statements in this questionnaire had both positive and negative directions. The positive direction per negative direction of children was 3 per 3 and parents were 6 per 6, respectively.

Each item was accompanied by three-response choices: agree, don't know and disagree. The meanings of the corresponding choices are as follows:

Agree means the respondent strongly agreed with the statement.

Don't know means the respondent did not know about the statement.

Disagree means the respondent strongly disagreed with the statement.

Criteria for scoring are as follows:

Responses	Score for positive direction	Score for negative direction
Agree	3	1
Don't sure	2	2
Disagree	1	3

For children: The obtained score of the perceived health status questionnaire were categorized into 3 different levels (agree, don't sure, and disagree) by maximum minus minimum score divided by 3. This presents the level of respondent's health perception of their obesity as following:

6-9 poor level

10-13 moderate level

14-18 good level

For Parents: The obtained score of the perceived health status questionnaire was categorized into 4 different levels (strongly agree, agree, don't sure and disagree) by maximum minus minimum score divided by 3. This presents the level of respondent's health perception of their obesity as following:

12-23 poor level

24-35 moderate level

36-48 good level

The interval scale of each level could calculate from this formula:

$$= \frac{\text{Max} - \text{Min}}{3}$$

The perception of obesity in children and parents questionnaire was developed by the 5 specialists for the content validity, language, and sequences of the questions checking including the providing suggestions for improvement. These questionnaires were examine content validity from 5 expertise Content validity index was 0.97. Then, the questionnaires were piloted with 30 student and parent families at

a school similar to the study setting to check the consistency and reliability in answering questions. The Cronbach's alpha was calculated to test internal consistency in pilot study. The Cronbach's alpha coefficients for perception of obesity in children and parents were 0.74 and 0.79, respectively.

4.3 The consumption behavior of children and parents

This study used the dietary intake record of Three day food record instruments for assessment the children's food consumption patterns. The children and parents recorded 24-hours-recall for 3 days in 2 weekdays (working day) and 1 weekend day (holiday) for estimation the calories of food per day.

For children:

The questionnaires of children's consumption included frequency of meal consumption, type and frequency of food consumption as follows: sweet food (Thai dessert, bakery, candy, chocolate), fast and fat food, fruits juice and soft drink, and fruits. The food pictures are used in this part. These variables were measured as three day food record in 1 weekend day and 2 weekdays by 24 hour recall for estimation the calories of food per day. The questionnaires of children's consumption as follows:

Part 1: The frequency of meal consumption

Part 2: The type and frequency of snack or food between meals consumption per week.

The type of snack or food between meals included the popular food consumption in children as follows: sweet food (Thai dessert, bakery, candy, chocolate), fast and fat food, fruits juice, soft drink, and fruits.

Part 3: Three day food record for children in school (24-hour recall)

For parents:

The questionnaires of consumption included the parent and children eating behavior. The questionnaires as follows:

Part 1: The food consumption of their children

Part 2: Three day food record for parents and children (24-hour recall)

4.4 The physical activities and exercise behavior of children and parents

The researcher developed this part and modified the assessment of energy expenditure of Bouchard three-day physical activity record (Bouchard et al., 1983; Pereira, FitzGerald, & Gregg, 1997). Test- retest reliability of questionnaire in adult and children was 0.97 and 0.91, respectively (Bouchard et al., 1983; Pereira, FitzGerald, & Gregg, 1997).

Nine activity groups were lying down, seated, standing; light activity, moderate activities, light manual work, light sport or leisure activities, moderate manual work, moderate sport or leisure activities, and intense sport and manual work. The physical activities were computed as follows:

1) The approximate energy expenditure

The energy expenditure was calculated from each activity as shown in the table 3-1.

Table 3-1: The category of activity and approximate energy expenditure for analyze the energy expenditure of participants

Category of activities	**Example of activity for each category**	**Approximate energy expenditure (kcal/kg./15mins.)**
1.Lying down	Sleeping, resting in bed	0.26
2.Seated	Listening in class, eating, writing by hand or typing, Reading, listening to the radio or TV, taking a bath	0.38
3.Standing; light activity	Washing oneself, shaving, combing hair, dusting, cooking	0.57
4.Moderate activities	Getting dressed, Taking a shower, driving a car, taking a walk (strolling)	0.70

Table 3-1: The category of activity and approximate energy expenditure for analyze the energy expenditure of participants (cont.)

Category of activities	Example of activity for each category	Approximate energy expenditure (kcal/kg./15mins.)
5.Light manual work	Sweeping, quick walking, sweeping, painter	0.83
6. Light sport or leisure activities	Volleyball, table tennis, golf, sailing, cycling	1.20
7.Moderate manual work	Plantation work, loading bags or boxes	1.40
8.Moderate sport or leisure activities	Badminton, dancing, tennis, jogging, swimming	1.0
9.Intense sport and manual work	Running in a race, boxing, basketball, football	1.95

2) Time for physical activity.

Duration of time of physical activity has 5 stages / wk as follows:

< 15	minutes	1 point
15 – 30	minutes	2 points
31 – 45	minutes	3 points
46 – 60	minutes	4 points
60 – 75	minutes	5 points
…….	minutes	According to the period of time

3) Energy expenditure of physical activity compute from

Energy expenditure = Energy × Weight × Time

Energy = energy expenditure of activity/kg./15 mins.

Weight = body weight of individual subject

Times = the frequency of 15- mins. periods of time

Example: 70 kgs. parent had type and duration of physical activity and exercise /day

Table 3-2: The example of activity and approximate energy expenditure

Duration	Activities/exercise	Duration	Activities/exercise
10.30 pm.- 06.00 am.	Sleep	12.00-12.15 pm. 12.45-1.00 pm.	Walking back and forth to lunch.
06.00-07.00 am.	Cooking (30 mins.) Breakfast (15 mins.) Wash the dish (15mins.)	12.15-12.45 pm.	Lunch
07.00-07.30 am.	Bath, Dress	5.00-7.00 pm.	Cooking, (30 mins.) Dinner, (15 mins.) Wash the dish (15 mins.)
07.30-08.30 am. 4.00-5.00 pm.	Driving to work and drive back home	7.00 -8.30 pm.	Teaching the homework's children
08.30-12.00 am. 1.00-4.00 pm.	Work Please specify …office...	8.30-10.30 pm.	Watching television, Bath (15 mins.)

Entering data: The Bouchard three day physical activity records

Activities	n × 15-mins. periods	Energy/ Kg/15mins.	Activities	n × 15-mins. periods	Energy/ Kg/15mins.
Sleep	34	0.26	Driving	8	0.70
Cooking	4	0.57	Work(typing)	26	0.38
Breakfast, Lunch, Dinner	4	0.38	Walking	2	0.70
Wash the dish	2	0.83	Teaching the homework's children	6	0.38
Bath, Dress	2	0.70	Watching television	7	0.38

Example: Energy expenditure = Energy × Weight × Times

0.26 kcal/kg/15 mins. × 34 15-mins. periods= 8.84 kcal/kg

0.38 kcal/kg/15 mins. × 43 15-mins. periods= 16.34 kcal/kg

0.57 kcal/kg/15 mins.× 4 15-mins. periods= 2.28 kcal/kg

0.70 kcal/kg/15 mins. × 12 15-mins. periods= 8.4 kcal/kg

Total = 35.86 kcal/kg expended for Day 1

Weight of individual = 70 → 35.86 kcal/kg × 70 kg = 2,510 kcal expended for Day 1

The collected data of consumption behavior, physical activities and exercise behavior of children and parents were rechecked and prepared for analysis by the investigator.

The physical fitness of children

The physical fitness of children was measured by Sports Authority of Thailand Simplified Physical Fitness Test, SATST for test the basic physical performance of people over 7 years old. The physical fitness included the speed, muscle power, muscle strength, muscle endurance, agility, flexibility and general endurance. The participants were assessed by 5 activities including; push-ups, sit and reach, standing broad jump, and zig-zag run. (Division of Sport Science, 2011).

4.5 The waist circumference

The waist circumference had proved to be a useful tool for assessing risk for obesity and related disease and a well-known predictor of abdominal. Waist circumference could show to correlate with fat mass at intra-abdominal. The measurement process was done according to the National Heart, Lung, and Blood Institute (NHLBI) report on obesity (NHLBI, 1998; NHLBI, 2000). Two persons of the researcher team measure waist circumference in children at the privately screened area, the child were asked to stand erect on both feet, lower the pants or skirt to the hip and pulled up the shirt. One person of the researcher team stand in front of the subject and the second person stood behind and to the right of the subject and palpated the hip area to locate the right ileum. Using a nonpermanent marker, the researcher team drew a horizontal line just above the uppermost lateral border of the right ilium at the midaxillary line of the body. The researcher team placed the measuring tape around the trunk in a horizontal plane at the level marked. The tape was parallel to the floor, and

snug by did not compress the skin. The measurement made at the end of normal expiration.

4.6 The Triceps and Subscapular Skinfolds

The triceps and subscapular skinfolds measured three times and averaged. Skinfolds were measured in children on the right side of the body using skinfold caliper. The caliper was borrowed from the Sport Science Bureau, Department of Physical Education, Ministry of Tourism and Sports. The type of skinfold caliper was Lange Skinfold Caliper that was manufactured by Beta Technology Inc. This has widely used in schools, colleges and fitness centers because it easy-to-read scale permits reading up to 60 mm and accurate to +/- 1 mm.

Triceps skinfolds measured between acromion of scapular bone and olecranon process of ulnar bone. The subscapular skinfold measured 1 cm. inferior to the inferior angle of the scapular. The triceps site was determined by using a tape measure to locate the midpoint between the acromion of scapular bone and olecranon process of ulnar with the elbow bent 90 degrees. The subscapular measurement took diagonally 1 cm. below the scapular at inferior angle, following the natural fold of the skin (NCHS, 1987).

The researcher team was trained to mark the skin with a nonpermanent marker, and gently grasped the skin and underlying subcutaneous adipose tissue between students left thumb and index finger. The skinfold was held with the thumb and forefinger 2.0 cms. above where the measurement, and the calipers jaws was placed perpendicular to the length of the fold. The skinfold was measured to the nearest 0.1 mm. while the fingers continue to hold the skinfold. The actual measurement of the caliper read about 3 seconds after the caliper tension was released and called to the recorder.

4.7 Weight and Height

Weight was measured without shoes to the nearest 0.1 kilogram. The weighing apparatus would calibrate before measurement. Height was measured without shoes. Weight and height measurement was measured in students about twice and averaged for recording. To ensure reliability, the researcher team was trained and tested for reliability prior to each data collection, by determining correlations when measuring skinfolds on the same subjects.

The triceps skinfolds, subscapular, weight, height, and waist circumference measurement were performed in a private room and averaged according to the National health and Nutrition Examination survey procedures (Najjar et al., 1987).

4.8 The body fat percentage

The body fat percentage was measured by skinfold caliper and tape for skinfold thickness measurement. Percentage of body fat was calculated with use of the equation of Tricep Skinfold Thickness (TSF) measurements from Dezenberg et al., (1999).

The equation is $\frac{[(0.342 \times \text{Weight})+(0.256\times\text{Triceps})+(0.837\times\text{Sex})\ ]}{\text{Weight}} - 7.388 \times 100$

Remark: Sex is 1 for male and 2 for female.

4.9 School management assessment

This process performed in the phase III (step 3) or Evaluation outcome.

The contents of question composed of the beneficial of the program, the activities or policy in the future, the responsible person in program, the sustainable of program and lesson learned in study. The in-depth interview of school director, teachers, food cookers, parents and the focus group discussion of students was conducted.

5. Data Analysis

This phase used both the quantitative and qualitative method. The qualitative method used in-depth interview and focus group discussion.

The quantitative method was analyzed by using statistical procedures as follows:

1) The dietary intake per day was analyzed the average by the nutrition calculates program, INMUCAL, Institute of Nutrition, Mahidol University.

2) Descriptive of demographic information, baseline characteristics, nutritional status, respondent's perception of their obesity, type, frequency and calories of dietary intake per day, the carbohydrate-protein-fat of dietary intake per day, energy expenditure of physical activity and exercise per day, physical fitness and body fat

percentage and waist circumference of children were analyzed by frequency, percent, mean ± standard deviation.

3) Examination the outcome of program in each time of the respondent's perception of their obesity, calories of dietary intake, energy expenditure of physical activity and exercise per day, and body fat percentage of children were repeated measures analysis in experimental group and control group.

6. The Protection of Human Subjects

Protection of human subjects was approved by Institutional Review Board (IRB) No. 2012-100 of Faculty of Public health, Mahidol University. The DLHPS was identified by researcher. The obese children in grade 1-3 of elementary students were eligible by research and teachers. The parents of student received a letter inviting for participant in the research study. The participants were invited to activity at school. The participants were asked to sign in informed consent form. If participants wanted to discontinue, the research project could allow discontinuing for the research anytime, without any prejudice.

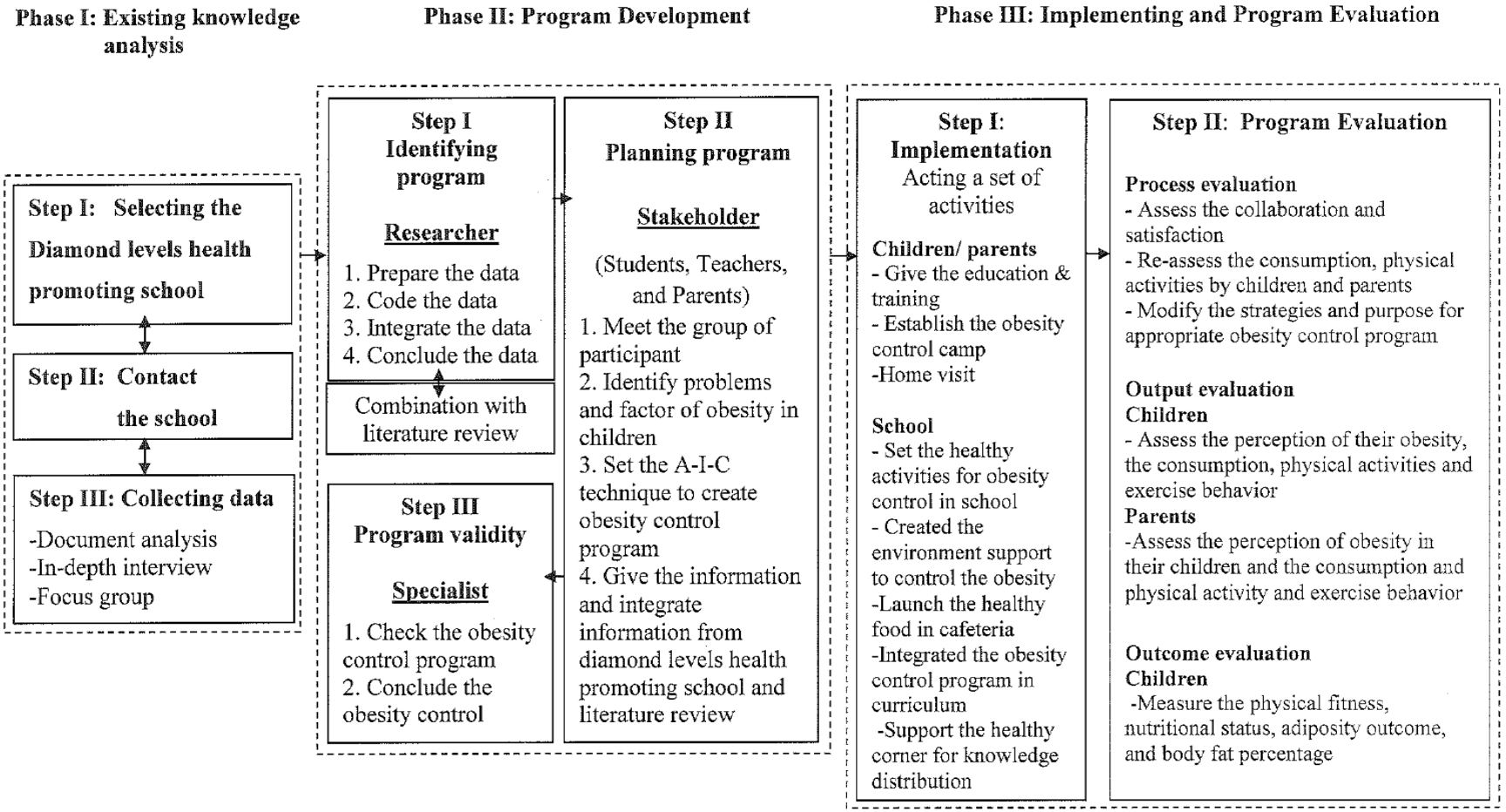

Figure 3-1: The research procedure

CHAPTER IV
RESULTS

This research based on mixed method design; embedded experimental research design and has the objective to analyze strategies, and means of activities in obesity control program from the DLHPS and to develop and test the new program with participation from school, students, and parents. The research results were presented in three major parts as follows:

Part I: Existing knowledge analysis

1. Background characteristics of the participants
2. The results of the qualitative study
3. The activities from review literature to the obesity control program

Part II: Program development

1. The participants' cooperation
2. The program of the obesity control program in elementary school student

Part III: Implementing and Program evaluation

1. The evaluation of the participation in obesity control program
2. The opinion after completing the obesity control program
3. The effectiveness of obesity control program

Part I: Existing knowledge analysis

Four DLHPS areas were selected by purposive sampling that were the setting school located in central part of Thailand, school had obesity prevention project at least 3 years consecutively, nutrition content was integrated in nutrition education, physical activity subject and other subjects at least 1 subject, and school had the willingness to participate. The content of school A, B, C, and D was concluded and shower in Table 4-1 as follows:

Table 4-1 General data of DLHPS (n=4)

DLHPS	Outstanding activities	The key success factors	The sustainable development
A	-The low sweet beverage from herbs and fruits	-The health promoting school policy and the best planning -The cooperation of all parties such as school director, teachers, students, parents, health authorities, and community	-The generalization to the other schools, and communities -The assessment, follow, and evaluation in the obesity control program
B	-The healthy food consumption for health	-The intention of teachers for activities creation -The participation of all parties such as school director, teachers, students, parents, communities, government sectors, and private sectors helped to succeed in all activities	-The school development to Asian for role model about health promoting school

Table 4-1 General data of DLHPS (n=4) (cont.)

DLHPS	Outstanding activities	The successful factors	The sustainable development
C	-The healthy activities project for obesity solving -The exercise in the morning -The healthy food for obese students	-The school directors emphasized on the health promoting in school -The participation from parents communities, government sectors, and private sectors -The teamwork and teacher's awareness in health of students in school	-The curriculum development for health promoting school -Home visit in students for 2 times/ semester -Healthy projects creation in school
D	-The vegetables consumption project -The read smart and eat smart project -The integration about obesity control contents into all subject	-The integration of healthy content to all subjects -The participation among school, home, and community -The focusing on the healthy problem solving in school	-Healthy corner and healthy radio in school

1) The background characteristics of the participants

The participants were 4 school directors, 8 teachers, 6 school food cookers, and 36 students. For the characteristics of 4 school directors, the results found that average age of school directors was 55.2 years old. Two out of four persons were age 61-70 years old. Most school directors had the period of time for this position about 11-20 years. The average time was 17.7 ± 13.0 years. Moreover, third of four had

period of time for participation in health promoting school was 6-10 years. The average time was 7.0 ± 2.0 years.

Table 4-2 General characteristics of teachers (n=8)

General characteristics	Number
Age (Years)	
21-30	1
31-40	4
41-50	2
51-60	1
Min, Max 28,52	
Mean 39.0 ± 9.6	
Period of time for this position (Years)	
1-10	4
11-20	3
21-30	0
31-40	1
Min, Max 3,33	
Mean 13.2 ± 9.9	
Period of time for participation in health Promoting school (Years)	
1-5	5
6-10	3
Min, Max 3,8	
Mean 5.2 ± 2.0	

From Table 4-2, most samples of teachers were age 31-40 years old. An average age was 39.0 years old. About half period of time for this position was 1-10 years. Most samples of teachers had the period of time for participation in health promoting school about 1-5 years.

Table 4-3 General characteristics of food cookers (n=6)

General characteristics	Number
Age (Years)	
21-30	1
31-40	2
41-50	3
Min, Max 25,49	
Mean 38.5 ± 9.7	
Period of time for this position (Years)	
1-10	4
11-20	2
Min, Max 1,18	
Mean 6.6 ± 6.8	
Period of time for participation in health Promoting school (Years)	
1-5	3
6-10	3
Min, Max 1,8	
Mean 5.2 ± 2.0	

From Table 4-3, about half samples of food cookers were age 41-50 years old. An average age was 38.5 years old. Most period of time for this position was 1-10 years. The period of time for participation in health promoting school was 1-5 years and 6-10 years.

From Table 4-4, most samples of students were age 10 years old. An average age was 10.7 years old. Most students were girl. The education level was between Grade 3-7 and most of them were study in Grade 6.

Table 4-4 General characteristics of students (n=36)

General characteristics	Number	%
Age (Years)		
8	2	5.5
9	1	2.8
10	14	38.9
11	7	19.4
12	11	30.6
13	1	2.8
Min, Max 8,13		
Mean 10.7 ± 1.1		
Sex		
Boy	8	22.2
Girl	28	77.8
Education level		
Grade 3	2	5.5
Grade 4	6	16.7
Grade 5	6	16.7
Grade 6	16	44.4
Grade 7	6	16.7

According to the results of 4 DLHPSs, the participants in this period had the experience for involving the obesity control program. Most of school directors had the time for this position was 11-20 years and the time for participation in health promoting school was 6-10 years. Including the cooperative team or teacher and food cooker team had the experience in this project about 1-10 years. Most of students were age 10 years old, and most of them were study in grade 6 therefore they could reply the complete questions. This content of obesity control program from these groups was the role model and lesson learned to conduct the appropriate program.

2) The results of the qualitative study

According to the in-depth interview with school directors, teacher, and food cookers, and focus group discussions in students at 4 DLHPSs, the question of in-depth interview and focus group discussions were 14 and 3 items, respectively. The answer of result could separate many categories by including the activity of obesity control program in school.

The results of the interview were separated 4 groups that included the 1) school; school director and food cookers, 2) teachers, 3) parents, and 4) students as follows:

Group 1: School

In the school group, the school director and food cookers were included in this group because they were the main content of obesity control program in school. The component of content included 7 categories.

1: The initiation of the obesity control program in school

The initiation of the overweight control project in school was the policy of health promoting school and the increasing of overweight in students including the health of students that referred to the score of students as follows.

1.1. The policy of health promoting school

The first reason in three of four schools had created the health promotion policy in school according to the health promoting school policy for 5 - 9 years ago. For example, a school director said *"This school had received the copper level health promoting school since 2004 or the school had established. In the years later, we could get the gold level health promoting school." (School director A)*

"This school was established for 62 years and had joined the health promoting school in 2008. At that year, we got the goal level health promoting school and received the DLHPS in the next 2 years." (School director C)

1.2. The health of students about the obesity in students

One out of four schools had the reason for creation the health promoting school that was the obese student increasing. For example, a school director said *"We had the problem of the student's health that came from the obesity in*

students. The problem was the obesity in children about 17 % (HPS criteria should not exceed 7 %) therefore we concerned with the health of children from obesity and decided health promoting school participation." (School director B)

The result of student health especially the obesity in students referred to the score of students. For example, a school director said "*The first time that we performed this program. We observed the obese students were not improved in the academic achievement score. They were the lowest score group and less enthusiastic, so we thought that obesity was the cause of these things. It was the beginning of the project. We controlled the eating and exercise behavior. After that, they had the better score. They started to learn and read the book. They play sport and they were not fat. Although this result was not 100%, it could move up in positive way." (School director A)*

2: Process of project management and control overweight in school

The starting of project management process was set from all sectors of the committees for working in health promotion school such as school director or administrators, teachers, parent representatives, student representatives, food cooker representatives, and public health officers.

A school director said *"In each activity had committee about 6-7 people for responsibility. I couldn't do it by my own." (School directors C)*

A school director said *"This school had committee for health promoting school. The department of health had the health promoting school policy and created the gold, silver, copper, and DLHPS. The board of directors came from all parties. For this school, we had the committee 15 persons that included the teachers, parents and student representatives, food cookers and health officer in district level. The school health teacher was the main activity person. Health promoting school had 10 components such as the first component about policy. Each component had a sub-project that had the responsible person. We monitored the project for 1 time per semester around July to August. The head of committee was the assistant director of school. She appointed the teacher who responsible the project and asked the result of project that could do it according to plan or not, therefore, we had to follow up." (School director A)*

From this content showed that the school health teacher was the main activity person. School health teachers were a very important role because they were a key person in the project activity and health in school. They shared responsibility for the implementation of each activity to the other teachers in school to work as a team for healthy activity and follow up the activity of projects in the period of appropriate time. The goal of this work was to achieve the mission and policies of school's strategic plan. All schools had the same process as the Figure 4-1.

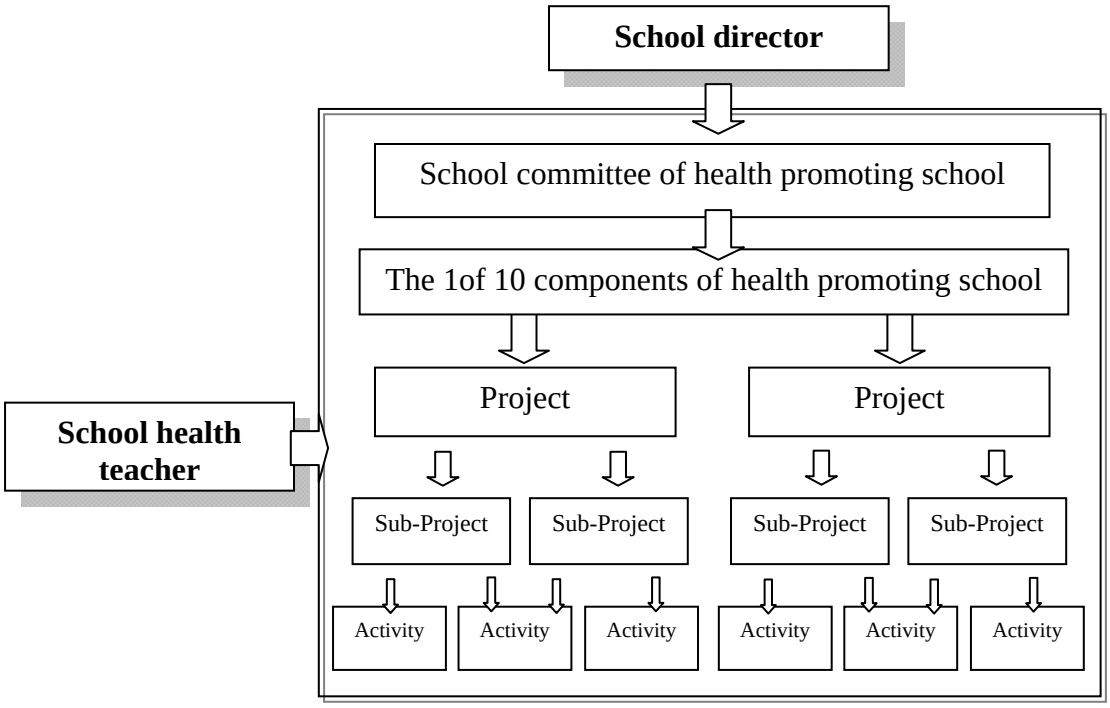

Figure 4-1: Represent the plan of operation of health project in school

3: The activity of obesity control program in DLHPS

All school had the many activities for obesity control program. All activities participated from all sections of school director, teachers, students, parents and food cookers. The example of activities that was nutrition education, integrating content of obesity prevention in all subjects, the message sending to parents for giving the knowledge at home, launch the healthy school lunch by emphasis on vegetables eating, exercise in the morning and the appropriate time. All activities were divided by 3 activity groups as 1) build awareness of the overweight students, 2) the healthy food in school, and 3) the exercise and sport for health.

3.1 Build awareness of the overweight students

3.1.1 Integrated obesity control content into each subject

Three of four schools integrated healthy content in some subject that was the basic of occupation and nutrition education subject as a school director said *"Most subjects that we integrated that was basic of occupation and nutrition education subject because of these subjects easier than other subjects. The basic of occupation subject used cooking food and benefit of vegetables." (School director C)*

Only one school could integrate healthy content in all subjects as a school director said *"We integrated obesity control content into each subject. Before we had integrated this content into all subjects, we discussed in our team. We integrated core content especially healthy food or nutrition into all subjects. Example, English subject used a healthy food in English name, Thai language subject used the caption and mind mapping, Science subject used nutrition label, Art subject used draw and paint fruits and vegetables picture, and nutrition education subject used the benefit and disadvantage of obesity in children." (School director D)*

3.1.2 Provide the healthy knowledge to parents and students

This activity was conducted for parent and student group.

The activity for the parents, three of four schools appointed the parents in the first day of semester. The parents would receive the information about the obesity in children and strategy of activities that should do in school and home as a school director said *"We invited the parents for meeting in the first day of semester. The issues of activities such as the cause of obesity in children, the obesity prevention, and the impact of obesity on children were presented in that day by doctor who expert in obesity in children. Therefore, the parents could understand and participate with school." (School director B)*

Only one school sent the information via letter to parents. The parents could receive the health information and activities that school conducted with students as a school director said *"We gave the information letter or*

newsletter to parents for 1 time per month. In this information letter, we had the work sheet for student. They could read, reply, and paint the picture in worksheet. Students could analyze and summarized content in worksheet. The parents had to sign after students finish the worksheet. All parents concerned about healthy contents that we created for students." (School director A)

The activity for the students, only one school had the healthy day for put the healthy information to students and two schools had the healthy corner in school.

A school director said *"We set the exhibition in school. Students could participate in this activity. We had the healthy corner which our help to create. Knowledge board, questions for answer, posters, and brochures were instruments for obesity controlling." (School director A)*

A school director said *"We built the healthy corner similar to the exhibition and we put the knowledge of obesity and healthy food in the subject for integration in all subjects." (School director D)*

3.2 The healthy food in school

Schools had many activities for controlling obesity in students. The activities were healthy food such as low sugar, fat, and salt food in cafeteria, eradication the seasonings from cafeteria, emphasize on vegetables and fruits eating in school lunch, vegetables planting in school, and lunch food separation between normal student group and overweight student group. The healthy food in school was described as follows:

3.2.1 Low sugar, fat, and salt food in cafeteria

All schools launched to have low sugar, fat, and salt food in cafeteria for decreasing of obese student and other diseases that associated with unhealthy food as a food cooker said *"We had the nutrition teacher to control the food cooker. We could control the food in cafeteria according to healthy food strategy." (Food cooker C1)*

Three of four schools had vegetables, herbs and fruits juice by sugar reducing. The formula of herbal and fruits juice was water 10 liters per sugar 1 kilogram as health promoting school criteria. A food cooker said

"This school didn't have the carbonated drinks for sale. We had the vegetables, herbs and fruits juice with low sugar. The price was 5-10 baht." (Food cooker A)

3.2.2 Not providing the seasonings in cafeteria

All schools got rid of the seasonings from cafeteria for reducing the amount of sugar from food of students.

A food cooker said *"In the past, students would add more the seasoning in their food about 2 table spoons of sugar. Our students were sweet addiction behavior, so they would receive more energy per day. When we collaborated in this project, I consulted in this point with teachers. I did not provide the seasonings in cafeteria and cooked by delicious flavor. I told the student who had to add seasonings to noodle that if you eat too sweet, you will have overweight, student believed me." (Food cooker B1)*

A food cooker said *"This school didn't have the seasonings in cafeteria because we cooked for delicious food." (Food cooker A1)*

Moreover the healthy food strategy of low sugar, fat, and salty food in cafeteria, not providing the seasonings in cafeteria, the other strategies such as emphasize on vegetables and fruits eating in school lunch, vegetables planting in school, and lunch food separation between normal student group and overweight student group were performed in the obesity control program by the detail of these activities would depict in teacher group session.

3.3 The exercise and sport for health

All schools had the exercise and sport activities for general and overweight students as follows:

For the general students, all schools had the activities for controlling obesity in students.

3.3.1 Exercise after national anthem in the morning

All schools had morning exercise after national anthem.

A school director said *"We had exercise every morning since kindergarten level to grade 6 about 15 minutes per day."*

A school director said *"In the morning, we had morning activity. The students would exercise by using Navi music. The preschool students and elementary-middle school were different in pattern of exercise. Duration of time was 10 minutes. The teaching of physical education subject was 1 hour which focused on exercise."* A school director said *"We had exercise in every morning. The exercise would use shoulder, foot, and knee rotation with music about 5 minutes." (School director C)*

For the overweight students, one of four schools had the activities for controlling obesity in students.

A school director said *"The core method of maintain student weight was diet and exercise. So, our school had exercise every morning. Overweight students could more exercise than regular exercise both of school and their home." (School director B)*

3.3.2 Exercise during the lunch time

One of four schools had the time for exercise in the lunch time after the students eating. General students could play the sport and exercise in school.

For the detail of this activity would present in teacher group session.

3.3.3 Exercise after school at school and their home

One of four schools had the activities for students who interested in exercise and special sport. This activity was including in both of general students and overweight students group. The exercise activities in the evening or after study in school helped to support overweight students. This student group could exercise in sport hour or wait for parents picking up them to home.

A school director said *"For childhood obesity project, we had the time after school. Overweight students would exercise on Monday, Wednesday, and Friday at school. The homes of most students didn't have area for exercise. Therefore, they had to exercise about 2 hours through 5.00 pm. for waiting their parent picking up. Obese children didn't like enforcement. We would open choice for exercise. Some student liked badminton. They would prepare the equipment of*

sport for playing in school." (School director B) For the details of exercise after school at their home would present in teacher group session.

4: The barrier of the obesity control program

For school directors, all schools had the problems and barriers. The problem that occurred with school director by happen in the first period such as parents didn't understand with healthy food in school, students couldn't eat vegetables because they liked to eat snack, carbonated drink, sweet and fat food. The workers confused about the criteria of DLHPS that was one of the problem of program creation.

4.1 Parent did not get involve in school activities

The problem from parents was the important thing that effect to activity of project. The changing of healthy food in school had the big problem of students and parents all school. All schools could find the method of remedy the problem by using the effective management.

A school director said *"The problems occurred in kindergarten's parents. They put the snack in school bag. They told me that their children might hungry when they finished class in the evening. The strategy was snack searching in school bags. After we told the reason, they didn't do it and understood us." (School director D)*

The strategy of all schools used the resolving problem as follows.

A director of school said *"For parents, I invited the public health authority to describe about danger of obesity in children and healthy, unhealthy food about 1 time per semester." (School director C)*

4.2 Students avoided eating vegetables and healthy food consumption

Major problem among students was avoiding the vegetables and healthy food consumption in students. The problem of children included the students reject to eat healthy food especially vegetables in their meal and vegetables, fruits and herbs juice with low sugar. Including the problem of students couldn't reduce the consumption of snack, carbonated drink, sweet food and fat food.

A school director said *"In the previous time, students had the problem of vegetables eating. They couldn't eat the vegetables. They would separate and waste the vegetables from their food tray to floor. Some student cried and hid the vegetables in their cheeks. The student who had the most problem was 1st grade students because they so young. The strategy was the cutting change of vegetables from long to short size. We had to slowly start, didn't force. Now, all students could adapt to eat the all types of vegetables." (School director B)*

A school director said *"Some student drank the carbonated drinking when they stayed at home. The correction was information the effect of it that could resolve this problem." (School director A)*

The strategy of all schools was the knowledge teaching by creating the healthy environment, exhibition and adding the content of obesity control in all subjects that could resolve the problem as follows.

A director of school said *"We solved this problem by promoting awareness to students via healthy corner. The activities included the drawing, painting, slogan writing about danger of obesity. We had the competition and awards for students." (School director D)*

The barrier for food cookers, after the schools had participated in obesity control program, many programs and activities occurred in school to control the overweight students in school. The result of many activities for controlling overweight in students was workload in all steps of activities. Some worker adapted and felt happy to work for healthy students in school. Collaboration of teamwork could help to alleviate the workload of each person.

For the activities of preparing food, some food cooker had the workload from the activities of obesity control program but they could do it because they loved their students and they could adjust their work as a food cooker said *"I had more workload. We had to prepare more vegetables. We had to clean, cut, and wash in water before cooking but we could adapt for our work." (Food cooker B1)*

A food cooker said *"The vegetables preparation process had many step for the best quality. We had the record to represent the quantity or portion size of food for lunch meal of students. Every student had to eat vegetables and rice according to criteria of food consumption in each age." (Food cooker D1)*

5: Lessons learned of obesity control program in school

The lesson learned of obesity control program in school for school directors and food cookers were divided into 2 elements. The first element was every people in school working together. All workers helped to do all activities for successful project. The second element was the information from healthy food that could use it in their healthy life such as the new knowledge about the quantity or portion size of food in each day, healthy food and the vegetables clean process.

For school director, the cooperation of all parts of worker helped for successful project management as a school director said *"The success of project came from participation of all stakeholders such as public health representative of province, sub-district and district, teachers, representative of community and parents. The continuous follow up the process of work and the monitor was important thing for showing the efficiency of work that referred to sustentation project." (School director B)*

For food cooker, the activities of healthy project could apply for their students as a food cooker said *"Our students didn't eat vegetables because they didn't like green vegetables. Therefore, we applied the vegetables from green to orange/yellow vegetables for colorful meal. The vegetables plantation in garden's school was one strategy. The food cookers brought vegetables from garden to school lunch meal. Students were proud when they ate the vegetables that they planted by themselves." (Food cooker B1)*

6: The successful factors of in obesity control program in school

The most of successful factors in this project was cooperation of all parties. The Ministry of Public Health and Ministry of Education provided the policy that related to health promotion in school. School director and teachers transferred the policy in through application of many school activities such as nutrition education, healthy food, and healthy activities in school. These led to the successful project.

For school director, a school director said *"This project could succeed from parents, students and teachers. The reward didn't give me but the reward did give everyone." (School director C)*

For food cooker, a food cooker said *"The first of success factor was school director. She had benefit idea for school. Moreover, the teachers, parents, and students gave cooperation." (School director B)*

7: The projects and activities in the future

All schools would continue the programs and activities in the future because of the health promoting school award. They would develop the activities for better project such as had the school nurse in school, arrange healthy camp, and distribute the knowledge of obesity prevention to community or other schools.

A school director said *"We would do the project continuity because our school was health promoting school." (School director A)*

A school director said *"We would do the next project but we didn't repeat activities same as the past. We would develop other health projects. We would ask for public health care center about the new criteria. We had to develop my project and had a school nurse for prevention and treatment of the first aid in school." (School directos A)*

The information from school directors and food cookers were the part of the obesity control program. The other sources of the obesity control program came from teachers and students that were showed as follows:

Group 2: Teachers

In the teacher group, the contents about obesity control program had 5 categories as follows:

1: Process of project management and control overweight in school

The starting of project management process was set by the committee all sectors for working in school health promotion such as directors or administrators, teachers, parent representatives, student representatives, food cooker representative, and public health officers.

All schools, the teachers received the health promoting school policy from school director. The good management of project in school was the participation of

every worker in school such as teachers, food cooker, and students. Especially, the teachers had to do the best and helped together in their work as a teacher said *"About administration, at the time of the issues receiving from school director, we would set the teacher meeting. We shared responsibility base on expert and appropriate teacher. For Nineteen indicators of* DLHPS*, we would concern for sharing the work. Every teacher could receive work that wasn't overload in one teacher. So, all teachers helped together for the health project doing in school." (School director B)*

A teacher in one school described the administration process for obese student in school. The screening was the first process and building the awareness by nutrition education and adjusting eating and exercise behavior in school.

The important person was classroom teacher. They cared student closely. They helped to screen overweight and obese children for doing the health project. The activities were healthy food controlling in school lunch meal, education classes and exercise for overweight students as a school health teacher stated *"The process of project management and control overweight in school as follow:*

1) Screening obese children by classroom teacher and sent the name of obese student to center of school that the school health teacher was responsible.

2) Building the awareness and nutrition education by classroom teacher in home room hour. Teacher would teach the benefit of vegetables and point the other students can eat vegetables. So, you could eat it.

3) Adjustment of eating behavior, we reduced the fat food, sweet food, and soft drink. The teachers and food cookers would adjust the healthy food in cafeteria.

4) Adding the exercise behavior, teachers would have a duty to take care everything such as observe student during lunch meal, teach the student for eating and exercise behavior adjustment." (Teacher B)

Nutritional status screening by weight and height assessment was the first screening method for overweight and obese children finding. Building the awareness, adjustment of eating behavior, and adding the exercise behavior was performed to all students in school.

2: The activity of obesity control program in DLHPS

The part of obesity control activities in the opinion and answer of school directors and food cookers were presented in the above statements but the some part of activity was fulfilled by teacher group such as emphasize on vegetables and fruits eating in school lunch, lunch food separation between normal student group and overweight student group, and the exercise and sport for health as follows:

2.1 Emphasize on vegetables and fruits eating in school lunch

The healthy food in school about emphasizes on vegetables and fruits eating in school lunch were explained as follows:

All schools launched vegetables eating as a school health teacher said *"We had the campaign vegetables eating. We launched all students to consume vegetables. The head of student surveyed all students who couldn't eat vegetables and what kind of vegetables they didn't eat. The type of vegetables that they didn't eat would adjust cooking for easy to eat. For example, Kale, kids didn't like it, we would slice to little piece and mixed with pork for doing the fried rice and vegetables soup." (Teacher D)*

A school health teacher said *"We launched fruits and vegetables eating in lunch meal. The example lunch meal was vegetables soup and vegetables stir fry. Our dessert was seasonal fruits for 2 days per week and Thai dessert for 3 days per week."*

(Teacher A)

Two of three schools had the vegetables planting in school. This was the nice strategies for help the vegetables consumption as a school health teacher said *"Vegetables that students eat, come from the vegetables plantation in school. The student felt proud that they could plant by themselves. This was incentive to vegetables eating." (Teacher D)*

2.2 Lunch food separation between normal student group and overweight student group

The healthy food menu arranged for overweight students. Only one school had responsible teacher about the food and nutrition in school as a school nutrition teacher said *"We had the 12 healthy menus for lunch. I was graduated from*

nutrition field. So, I could arrange and control the menu and amount of food for my students in school". This school had the separation of lunch food between normal student group and overweight student group as a school nutrition teacher said *"We cooked healthy food for overweight students. Example noodle, we used pork soup in general students, but we used vegetables soup in overweight students. Both of methods had good taste and overweight student group loved to eat special food." (Teacher C)*

2.3 The exercise and sport for health

2.3.1 Exercise after national anthem in the morning

A school health teacher said *"We had exercised by aerobic every morning about 10 minutes. If today was sunny day, we would exercise about 2 rounds. If the weather of today was good, we would exercise about 6 rounds or appropriation. In the winter, we would exercise many rounds." (Teacher A)*

2.3.2 Exercise during the lunch time

One of four schools had the time for exercise in the lunch time after the students eating. General students could play the sport and exercise in school as a school health teacher said *"We had the lunch time for 1 hour. The students brought Hula-Hoop for playing this game in lunch time." (Teacher B)*

2.3.3 Exercise after school

One of four schools had the activities for students who interested in exercise and special sport as a teacher said *"We had the special hour for sport and exercise study such as Taekwondo, swimming, and football. The students paid this course with little money. The duration of time was 3 hour from 05.00 PM to 19.00 PM. Every student could participate with special course. At this time, we had 3 persons who overweight students participated with our." (Teacher C)*

Exercise after school at their home

Some student couldn't do the activity after school because they had to go to their home by school bus. The strategy of school was the exercise recording in their home by parents as a school health teacher said *"Some student had to back their home by school bus. Teacher would distribute the nutrition and exercise form to parents. The parents would record the pattern of nutrition and*

exercise in students when they stayed at home. The benefit of this activity was good controlling and monitoring in students at home by parents." (Teacher B)

All schools had many activities for controlling obesity in students. According to the in-depth interview in school directors, food cookers, and teachers, the activity of obesity control program in DLHPS had many activities for their students as Figure 4-2.

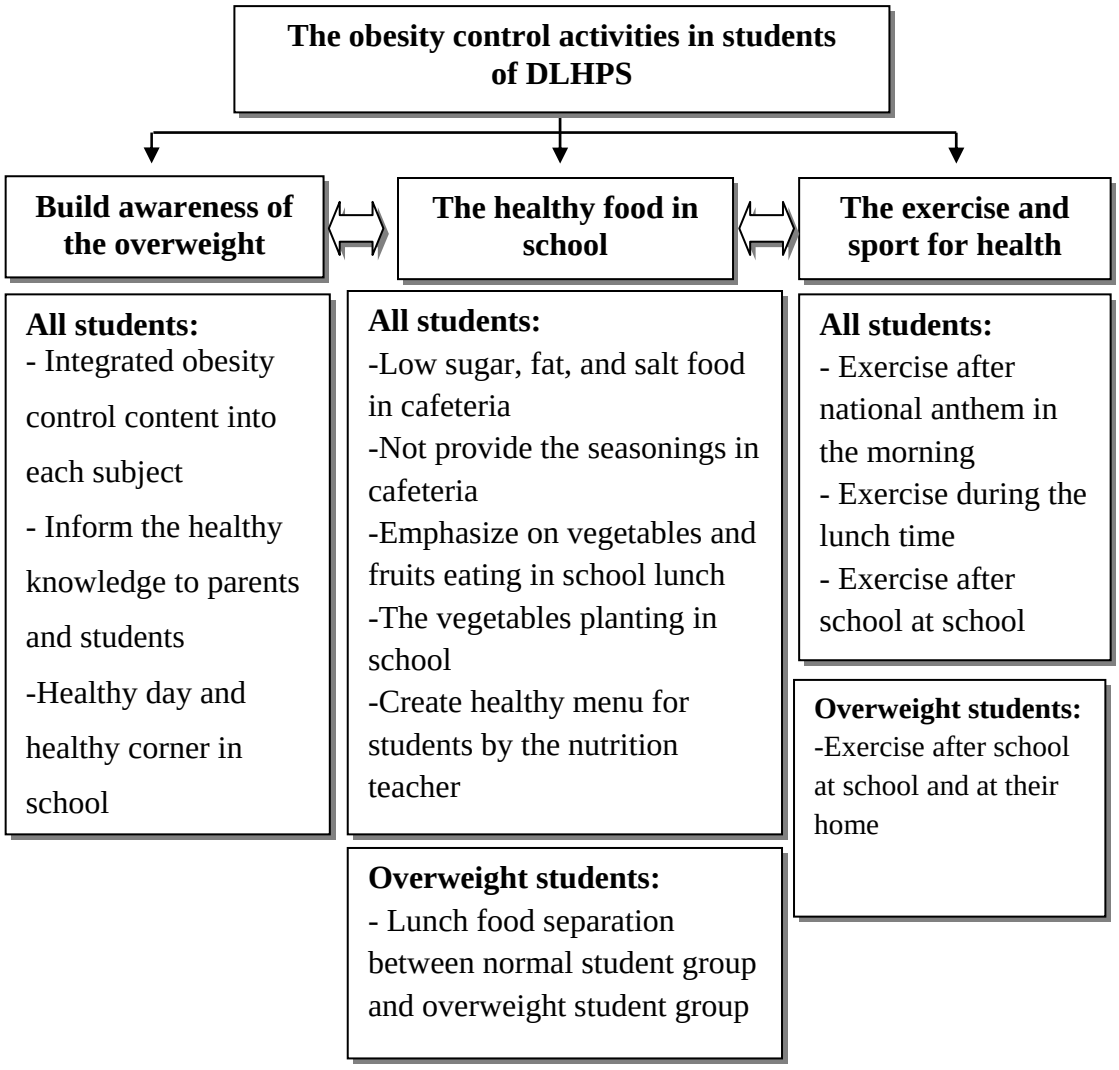

Figure 4-2: Represent the activity of obesity control program for students in 4 DLHPSs

3: The barrier of the obesity control program

Teachers in school were the main workers for moving this project. The problems that occurred with teacher were the workload and the slow helper from public health center as follows:

3.1 The workload from many activities and paper works

Some worker had the workload from the activities and paper work of obesity control program but they could adjust their work as a school health teacher said

"The workload was a lot of paperwork. I had to teach about 3 hours per day. So, I didn't have more time to do the document. We had to do it after class. Paper work of DLHPS had many details and indicators." (Teacher A) Collaboration and teamwork helped to alleviate the workload as a school nutrition teacher said *"The teamwork was the best strategy. We divided the activity to all teachers. We help to perform the activities although this activity didn't my responsible activity, thus we would pass this work." (Teacher D)*

Even if most of teachers had more the workload, they conducted their work by volunteers. Most of workers could adapt and feel happy to work for healthy students in school. Collaboration and teamwork helped to alleviate the workload of each person as a school nutrition teacher said about their workload *"No, it doesn't. These activities didn't the burden. The activities were similar to the routine work. We taught about nutrition content and calories calculation of food in cooking subject." (Teacher C)*

Some teacher had the workload from the activities of obesity control program but they could do it because they loved their students. They felt pleasure when they conducted the activities for their students as a teacher said *"We conducted it with my heart because I loved to do this. I loved my students. Students made me pleasure." (Teacher C)*

3.2 Public health officer arrive late for help in preparing document

One of four schools had the problem from public health authority. They didn't suggest about DLHPS criteria writing on time.

A school health teacher said *"We had the problem from outsiders. The documents of DLHPS had to connect with responsible hospital or public health authority. The last year, we had the problem. The public health authorities came to help me in late time. The strategy was good communication. We told them for help us in early time because they had more work and couldn't help us immediately." (Teacher D)*

3.3 The students reject the vegetables and healthy food consumption

For teachers were the direct activities people with students. Therefore, they would find the many problems such as the students didn't want to participate in healthy food eating as a school health teacher said *"We had the big problem. Our students didn't eat vegetables. We consulted food cooker for finding the best way. We knew that students didn't like green vegetables. Therefore, we applied the vegetables from green to orange or yellow vegetables for colorful meal. The vegetables plantation in school was the one strategy. Our students felt proud because they ate the vegetables that they planted by themselves." (Teacher D)*

A school nutrition teacher said *"The students didn't eat vegetables that was the problem. They informed against to their parents. We had to solve this problem. We invited the health care center authority for healthy food, benefit of fruits and vegetables teaching. I established "Loog Na-vig Rai Pung" (The children of navy soldier do not have belly) for behavior adjustment in overweight students." (Teacher C)*

3.4 The parents reject the project participation

The first time, parents didn't understand with our healthy project. They didn't know about the reason of project. They thought that their child didn't happy with vegetables consumption. Most parents indulged in their child. All schools had the nutrition education for solving this problem.

A school nutrition teacher said *"The first time, parents were not interested in problem of obese students because children liked to eat snack. I invited the expertise for nutrition education every semester in parent meeting. Moreover, we sent the newsletters for knowledge information and advised the obesity control contents and activities in school to parents." (Teacher C)*

4: Lessons learned of obesity control program in school

The lessons learned of obesity control program in school from the teachers included the effective learning of obese and normal students, the good health in worker team.

4.1 The effective learning of obese and normal students

From the lesson learn and experience of teacher, they could explain the interesting thing. Most of students who were obese had the inert study and sluggard. When they cooperated with project, they could improve their learning and life as a teacher said *"The lesson learn from this project was we could know the health of student. They would have well learning whenever they had healthy. We thought that we should build the good health for students. Exercise and healthy food behavior helped to build the awareness of taking care in their health. They were smartness, wellness, and happiness. They could bring the knowledge to their family. We were so proud that we could teach them to healthy person." (Teacher D)*

A school health teacher said *"We observed that the obese student had the study problem. They would have slow study. They couldn't do some activity in physical education subject. They didn't pass when they tested physical examination. Although, we tried to push them to normal growth, we received the higher reward of health promoting school. Our students had better health and study than before." (Teacher B)*

4.2 The health status of school personals

The obesity control program in school helped to student had the healthy and normal growth. Besides, it helped to adjust the healthy behavior in teacher as follows:

A school health nurse said *"Lessons for me was my blood cholesterol. I had cholesterol in my blood about 300. I was hardly to eat more vegetables and fruits. When I had to work in this project, I had lunch with students and I had to eat everything. I tried to eat them until I could eat more vegetables. Now, I could eat big onion and other vegetables." (Teacher A)*

5: The successful factors of in obesity control program in school

The successful factor of project was the cooperation of teachers as a school health teacher said "*The success factor was cooperation of teachers in school. We did it together. Teacher never said that they would abandon. Every teacher knew that we did it for my students. Therefore, we accepted to do it and we could do activities by rapidly." (Teacher B)*

A school health teacher said "*The success factor was everyone work together. School director was the key person who was healthy man and role model for students." (Teacher D)*

6: The projects and activities in the future

All schools were health promoting school and they received the highest reward of health promoting school. They intended to develop the healthy activities in school. They would have programs and activities to continue in the future because this was sign of health promoting school. Therefore, they would develop the activities for better project such as had the school nurse in school, distributed obesity prevention knowledge to community or other school, and arranged healthy camp in school.

A school nutrition teacher said "*In the future, we wish had the healthy or obesity camp. We would invite parent to participate for behavior adjustment." (Teacher C)*

According to the in-depth interview the teachers, they were the main focus for conducting this project. All schools, the teachers received the health promoting school policy from school director. Most of teachers had a lot of workload but they could conduct their work by willingness. The collaboration in teamwork could alleviate their workload.

Most problems that the worker as teacher met that was parents didn't participate and understand. They didn't know about the reason of project such as the healthy food of vegetables consumption. Their children couldn't eat lunch meal at school. Most parents indulged in their child. The strategy to solve this problem of all schools was informing the nutrition education to parents by expertise such as doctor, nurse and teachers. The result found that parent understood and participated with school.

The many benefic results occurred in school during the project process, such as the environment of school and cafeteria was better, the number of obese students was decreasing, teachers had good health, and the school had more new students in each year. In the future, teacher intended to develop the health activities and continue this health project in school because this was sign of health promoting school including support the student health.

Group 3: Parent

The parent was the important person for collaboration with obesity control activity in school. The participation of parent could study from the statement of school director, teachers, and food cookers. The components were divided into 2 categories as follows:

1: The communication between school and parents for cooperation with the obesity control program

The information and knowledge giving was the best activity that health promotion team should do it. When the parents had the understanding, they could help the school for controlling the obesity in children. The same direction for controlling the obesity in students was the cooperation between teachers and parents in school and home.

The activity of the obesity prevention was the control food and exercise at school and home. The activities were meeting the obesity student's parents and sending the information, recording the food and exercise questionnaire of students and parents while students stayed at home. The activities and responsibility of parents were as follows:

1.1 The parents meeting

All schools had the parents meeting for information receiving of project. The experts included the nutritionist, doctor, and nurse as follows:

A school health teacher said *"The students didn't eat vegetables and they accused with their parents that was the big problem. Nurse from primary health care was invited for information about the benefit of vegetables and fruits consumption." (Teacher C)*

A school health teacher said *"The last year, we invited public health nurse for teaching about obesity prevention in healthy and obese children. The*

result found that parents could accept and agree for participation in obesity control program of school." (Teacher D)

A school director said *"We had a parent meeting for 2 times per year. We would tell the reason of every activity that we did it with students." (School director D)*

1.2 The communication with parents by document

1.2.1 The homework book

Some school had the communication with parents by using the homework book as a school director said *"We had connection from school to parents by using the homework book. Every day classroom teacher sent information to parents. After parents read it, they would sign for acceptance in book. This was two way communications method between teachers and parents." (Teacher B)*

1.2.2 The letter

Some school had the communication with parents by using the letter as a school health teacher said *"We had a letter for parents. We informed that a child of you was overweight and we would help you for controlling and asking participation. We didn't tell this information to student. We closed the envelope to parent for preventing knowing in students." (Teacher B)*

1.2.3Questionnaire

One of four schools had the questionnaire for survey the satisfaction and consumption behavior as follows:

A school nutrition teacher said *"We would do the pre- and post- test questionnaire for survey the satisfaction and consumption behavior. The first time, the parent didn't satisfaction with school. In the next time, they liked the activities that we did. They would write more the activities such as this activity was good or this activity had to add more activity. They agreed with healthy food for their students." (Teacher C)*

1.3 The recording the eating and exercise questionnaire by parents

One of four schools had the eating and exercise questionnaire for parents. A school director said *"We had the consumption and exercise*

questionnaire for parent. They would check this questionnaire such as what were the student eating and exercise in today." (School director A)

A school health teacher said *"The parents helped teacher for exploring the eating and exercise behavior of their children while they stayed at home. Parents could check in questionnaire by real situation. Food frequency questionnaire was the frequency of food consumption. We sent the same questionnaire to parents after performed the activity in program. This result would compare between before and after doing the activity in program. The results had shown the changing behavior. The students could select the healthy food and reduce their weight to normal nutritional status." (Teacher B)*

2: The participation of parent in obesity control program

Parents were key person to help the activities of the obesity control program and continuation of program, when children stayed in their home. Agreement and interest of parents help the moving of obesity control program.

2.1 The agreement of parents

In the first phase of project, most parents didn't cooperate because they loved and cared their children. Some parents didn't agree with program as a school nutrition teacher said *"Before we launched the project, parents didn't agree. When we started the project, parents could see the improvement of children behavior. They agreed and participated in activity by represent the opinion about activity of project by writing the new activity and adding some activity for obesity controlling in children." (Teacher A)*

A school health teacher said *"The first time, parents didn't accept the activity in health promoting school. Some student told the parent that today didn't saturate eating because lunch meal at school had vegetables. Some parent put some snacks in student's school bag because they thought that their children might hungry during waited they to pick up them after finish school." (Teacher B)*

A school health teacher said *"The parent collaborated in project about 80 percent. The parents appreciated this project. Therefore project had success. Students and parents involved in the project that helped to succeed of project." (Teacher A)*

2.2 The interest of parents of in health activities in school

The activity of the obesity prevention was the control food and exercise at school and home. Some activity, the parents might be confused about the reason of activities to do such as the lunch meal changing in school as a food cooker said *"Now, the parents didn't have the problem. The first time, they asked me about the lunch menu changing in school. I answered her that this school was health promoting school. School wanted to support the healthy food in school by focusing on vegetables and 5 food components eating. In the next time, parents could accept this activity because their children could eat vegetables." (Teacher B)*

The parents were key person to help the activities of the obesity control program and continuation of program when children stayed in their home. The first time, parents couldn't participate in project. They didn't understand about health activities. After teachers set the meeting for information and knowledge giving by expertise including the improvement of children behavior and health, they agreed and participated in activity with school. School used the communication with parents for health information that had many ways such as document, homework book, letter, and questionnaire. In the latter time, the direction of obesity control program was the same way. They helped preparing for healthy food consumption and monitoring exercise behavior of student in their home. Therefore, the obesity control program could succeed from cooperation and participation of parent's students with school.

Group 4: Students

The students were the center of obesity control program. Everyone who was teachers, parents and food cookers help them to weight reduction and healthy children. The focus group method was used in this group. Five categories of students were showed as follows:

1: The obesity control program participation of students

All school had the many activities in obesity control program. Students could participate with these activities. The first activity was build awareness of the overweight such as integrated the obesity control content into all subjects, healthy day, and healthy corner in school as a student said *"I received the work sheets for obesity*

control knowledge in all subjects. I liked it so much because we could apply the knowledge between subject and healthy knowledge." (Student D1)

The healthy food in school was the second activity for students. All schools launched low sugar, fat, and salt food in cafeteria and emphasized on vegetables and fruits eating in lunch meal for decreasing the amount of obese student and other diseases that associated with unhealthy food. A student said *"Our lunch didn't have fried, sweet, and salty food. Food for sale with students had only healthy food such as fish ball, meatball and sausage steaming and fresh fruits without chili and salt."* A student said *"Our lunch focused on vegetables about 3-4 tablespoons and had fruits every lunch meal." (Student D8)*

One of four schools had a school nutrition teacher for healthy menu creating and for overweight students as a student said *"We ate school lunch differed from normal students. I liked it because it was same deliciousness as normal food but it has more benefit for me." (Students C6)* The example of activities was fruits, vegetables and herbal drinking with low sugar, exercise in the morning, lunch and evening time, and healthy food in school as a student said *"Low sugar in food and drink had the sweet controlling activity. We had herbals and fruits juice such as roselle and quince juice by controlling the amount of sugar." (Student A2)*

For the last activity was exercise and sport for health. All schools had the exercise in the morning about 10-20 minutes. All students liked this exercise because they could dance. A student said *"We aerobic danced in the morning about 20 minutes. We had the leader and we changed the song for aerobic dance every year." (Students A7)* One of four schools created the time for exercise in the lunch time by support the Hula hoop playing in school. A student said *"All students could join Hula hoop activity. Hula hoop dancing could reduce the body and relax the body. Students could play after lunch time and after school in period of meeting time. They could play at school in preparing area. Teacher supported this activity by open music for student. In the first time, Hula hoop playing was one of competitive activity in sport day that was encouraging student to exercise." (Student A5)*

2: The popular of activity

Most students liked all activities. Some students liked the exercise in the morning more than others activities and some student liked the healthy food consumption.

A student said *"The activity that I favorite was the exercise in the morning because it was fun and healthy activity." (Student A1)* A student said *"I liked exercise in the morning and vegetables eating because these activities help weight reduction. Before I had jointed this project, the weight was 90 kilograms. Now, I had weight 84 kilograms." (Student A4)* A student said *"I liked all activities because these had the benefic and funny activities." (Student B3)*

The students determined that all activities were the best activity and help to weight reduction. A student said *"The exercise, vegetables eating, herbal drinking were the activities that help to reduce my weight." (Student A8)*

A student said *"All activities were good that can't absent even one activity." (Student B6)*

3: The effect of healthy food and exercise to their weight

The effect between food consumption and bodyweight

All students knew the useful of healthy food consumption and body weight. The healthy food affected many benefits such as healthiness, shapeliness, freshness and cheerfulness. The effect between food consumption and bodyweight, the healthy food affected many benefits as a student said *"The type of food such as low fat, low sweet were the healthy food. These foods helped to normal weight. The normal weight was effect to healthiness and nice mood." (Student A7)* A student said *"The healthy food consumption helped to weight reduction, shapeliness, cheerfulness, healthiness, freshness, and smartness." (Student C1)*

The effect of exercise and bodyweight

The effect of exercise and bodyweight, all students understood in the effect of exercise and overweight. Most students replied the benefit of exercise that exercises helped to reduce weight and fat. A student said *"The exercise helped to good health, weight reduction, strength, and high immunity." (Student B9)* A student said *"The exercise helped to reduce fat, sweat, and fresh." (Student D2)*

4: The continuing of obesity control program

All students wanted to continue the project. They knew about the advantage of each activity in project. Although they had normal shape, they would participate in this project.

A student said *"I wished that the student representative brought the knowledge to community, built the stadium for people in community to exercise, and had the corner for present the health knowledge in school." (Student B5)*

A student said *"I hoped that this project would be continued. I had to participate in project although I had normal growth. If I didn't join in this project, I might have heavy weight." (Student C8)*

All students had more ideas about healthy food in school such as other herbs for mixing in low fat juice and healthy fat foods in cafeteria.

A student said *"I wanted to add the other herbs in drinking such as orange juice, lemon juice, Aegle marmelos juice and star apple juice." (Student A5)* A student said *"I wanted to add the healthy fat food by fat reduction or use little oil in cafeteria." (Student D2)*

5: The obesity in parent of students and strategy

The home members of most students were obese person. Students concerned about this problem and found the ways for solving.

A student said *"My mother was obesity. Every Sunday my father took my mother and me to the public garden for exercise." (Student A4)* A student said *"My father was obesity and diabetes mellitus patient. My mother prepared the healthy food especially fruits and vegetables for father." (Student C3)* A student said *"My mother and younger sister were obesity. Mother would cook healthy food for member. The vegetables were the main of food menu." (Student D2)*

The student said "*My grandparent was obesity. She liked sweet dessert. I advised her for low sugar eating." (Student B7) and "The body weight of my father was 98 kilograms. I told my father Hula hoop playing about 1-1.5 hours in every day. The other methods were fat food reduction. Now, the body weight of my father was 82 kilograms." (Student A5)*

According to the focus group in students, they were important person to treat and prevent the overweight and obesity. All students could participate with activities that school set to students. The example of activities that they could participate were healthy food, fruits, vegetables and herbal drinking with low sugar, and exercise in the morning, lunch and evening time.

Most of students liked all activities that school established included the exercise in the morning and healthy food consumption. The reasons were fun, healthy activity and weight reduction including the healthiness, shapeliness, freshness and cheerfulness. All students wanted to continue the project because these activities had the advantage for healthy and helped to healthy and normal shape.

Most of students had the obese person in home. All students concerned about this problem and helped to solve this problem. Students would persuade the home members for healthy food consumption and exercise. Some parent could reduce their weight from student suggestion. According to the obesity control activities in 4 DLHPSs could present in 4 groups as Figure 4-3

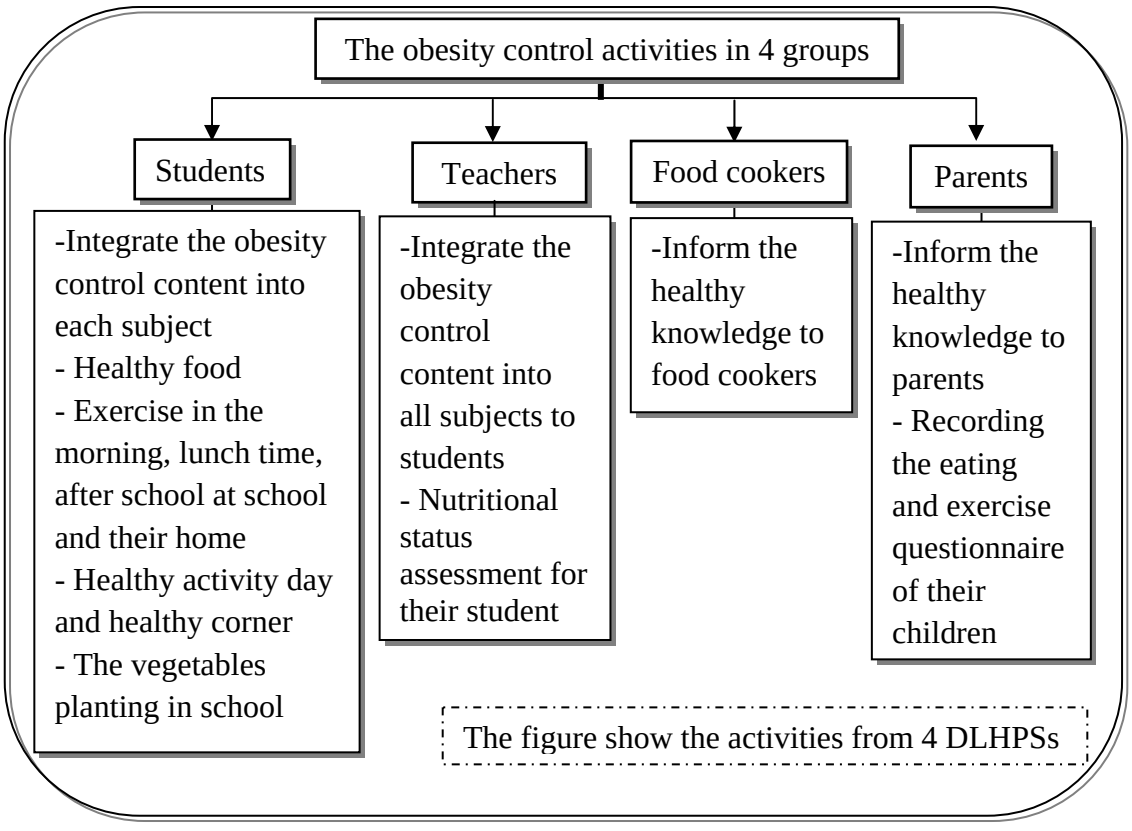

Figure 4-3: Represent the diagram of activity from 4 DLHPSs in student, teacher, food cooker and parent group

3) The activities from review literature to the obesity control program

The literature search was conducted by researcher in this step using the databases PubMed and CINAHL. Keywords that were used included “obesity”, “overweight”, “children”, “school”, “intervention” or “program”. Inclusion criteria for this review were: (1) English-language publication; (2) a research article evaluating form of intervention strategy for prevention or treatment of childhood overweight or obesity; and (3) publications between 2005and 2012. Exclusion criteria were articles in languages other than English, review articles and case studies. A total of 11 studies met the criteria. The activities from this resource were represented as Table 4-5.

Table 4-5 The activities from literature review to the obesity control program

Strategies for child obesity In each authors	
For students	**For parents**
Boon & Clydesdale, 2005	
1.Provided one-hour lessons on the nutritional to students	1. Have the newsletters been sent to families to encourage them to help their children reach their goals, and each family received an electronic television time manager.
2.The several childhood obesity intervention shave taken place is in after school or summer camp programs.(Boon et al., 2005)	-
Beth Yano, Ebesutani, Lu, & Choy, 2009	
1. Media, books, informational handouts, educational workshops.	-
2. Imagining their future health if they do not change and goal setting in their body shape.	-
3. Modeling. Children tend to model, or imitate, the behaviors of those around them.	-
4. Collect the data e g. increase in fruits intake, decrease in sugar intake, increase in physical activity, decreases in sedentary behaviors.	-
5. Sweets and snacks removed from view; fruits on display in kitchen; weights strategically placed in home.	-
6.Replace watching TV with engaging in an enjoyable physical activity; relaxation techniques.	-

Table 4-5 The activities from literature review to the obesity control program (cont.)

Strategies for child obesity In each authors	
For students	**For parents**
Jiang et al., 2007	
1. The contents of lectures included health consequences of childhood obesity, the food pyramid, increase the consumption of fruits and vegetables in children enrolled in the intervention.	1.Teach a 'traffic light' food item list was given to the parents to help children decrease their energy intake and consume a balanced diet.
2. The intervention aimed to increase physical activity as well by exercise.	-
3. Nutrition measurement -Weight and height were measured for students in the intervention schools twice each semester and recorded flow graph of obesity changes from baseline to end line. - Anthropometric measurements were taken every 2 weeks.	-
Howard, 2007	
1.They identified three ways of demonstrating whether their child had a weight problem: (a) when the child grew out of his or her clothing too quickly, (b) the child was teased at school, or (c)the child was experiencing physical limitations to his or her activity.	1. They proposed that interventions should be based on positive actions and role modeling by parents. Parents should be encouraged to provide a wide variety of healthy choices for their children and to allow considerable latitude in making decisions about food choices and quantity.
-	1. Have the newsletters been sent to families to encourage them to help their children reach their goals, and each family received an electronic television time manager.
DeMattia, Lemont, & Meurer, 2012	
1. Nutritionists have middle school children initially taste test several recipes with fruits and vegetables.	1.Increases the potential of children to walk and the possibility of parents exercise with children at home.
Doak, Visscher, Renders, & Seidell, 2006	
1. Education-based intervention discouraging the consumption of carbonated beverages, encouraging fruits intake, and promoting the consumption of water.	-
Stalter, Kaylor, Steinke, & Barker, 2010	
-	1.The''Parental perceptions of Body Mass Index and Obesity in School-Age Children'' survey was used in this study with permission.

Table 4-5 The activities from literature review to the obesity control program (cont.)

Strategies for child obesity In each authors		
Eisenmann, 2008		
For students	**For parents**	**For teachers**
1. The contents of these lectures included health consequences of childhood obesity, the food pyramid, increase the consumption of fruits and vegetables among children enrolled in the intervention.	1. The program is designed to make it easier for families to plan meals, include healthy snacks.	1.Teachers were provided the opportunity to integrate some of the contents into their classroom
-	2. Offer public education/training workshops for parents	-
-	3. The parents' baseline survey measured the target child's media habits, physical activity, amount of sleep, snacking habits, the target child's fruits and vegetables consumption.	-
Gronbaek, Madsen, & Michaelsen, 2009		
For food cookers		
1. Emphasis was placed on reducing the intake of fast food, drinks containing sugar and sweets, and on increasing the intake of vegetables, fruits and whole-grain bread.		
Greening, Harrell, Low, & Fielder, 2011		
For food cookers		
1. The activities, there were changes to the intervention school’s food service including replacing the deep frying equipment with baking ovens.		

According to literature review of 11 selected articles, the researcher could receive the important data of 4 groups for creation in obesity control activities in school. However, the activities from the literature review could help to add the complete obesity control activities as Figure 4-4.

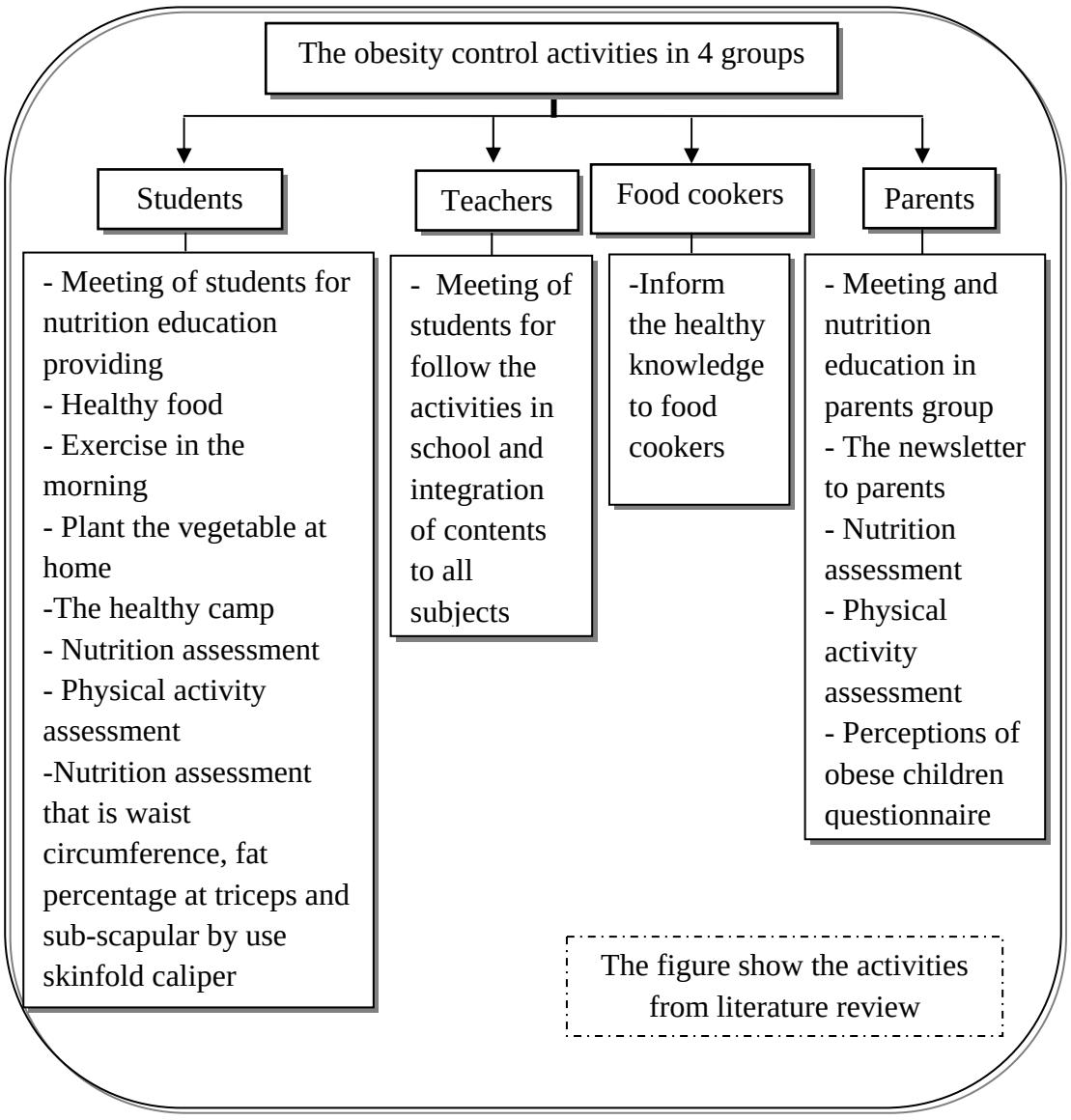

Figure 4-4: Represent the diagram of activity from literature review in students, teachers, food cookers and parents group

Elevens articles had the many activities for using in obesity control program. When combination the obesity control program between literature review and 4 DLHPSs, the result could put in protocol and apply in program as Table 4-6 to Table 4-9.

3.1 Students

Table 4-6 The student activities from literature review and 4 DLHPSs to the obesity control program

Activities from literature review /Author	Activities from 4 DLHPSs	Apply the activities in program protocol
1.Provided one-hour lessons on the nutritional to students (Boon & Clydesdale, 2005)	-Provide the healthy knowledge to students	-The meeting of students for nutrition education
2.Media, books, informational handouts, educational workshops. (Beth Yano, Ebesutani, & Choy,2009)	-Inform the healthy knowledge to students	- The nutrition education in students by manuals, informational handouts, and educational workshops
3. Imagining their future health if they do not change and goal setting in their body shape. (Beth Yano, Ebesutani, & Choy,2009)	-Inform the healthy knowledge to students	-A content of goal setting for the future -Add in homework "Dangerous obesity and protection" -Add in the "Notes of my nutrition and exercise"
4. They identified three ways of demonstrating whether their child had a weight problem: (a) when the child grew out of his or her clothing too quickly, (b) the child was teased at school, or (c) the child was experiencing physical limitations to his or her activity. (Howard, 2007)	-Inform the healthy knowledge to students	-The hazard of obesity -Add in the knowledge document of "Danger of obesity and protection"
5. Modeling. Children tend to model, or imitate, the behaviors of those around them. (Beth Yano, Ebesutani, & Choy,2009)	-Inform the healthy knowledge to students	- The content of role model in school -Add in homework "Dangerous obesity and protection"

Table 4-6 The student activities from literature review and 4 DLHPSs to the obesity control program (cont.)

Activities from literature review /Author	Activities from 4 DLHPSs	Apply the activities in program protocol
6. Sweets and snacks removed from view; fruits on display in kitchen; weights strategically placed in home. (Beth Yano, Ebesutani, & Choy,2009; Miller & Kral, 2011)	-Launch to healthy food in home	- The content of the moving the disadvantage food from the kitchen -Add in homework "Dangerous obesity and protection"
7. Nutritionists have middle school children initially taste test several recipes with fruits and vegetables. (DeMattia, Lemont, & Meurer, 2012)	- Launch to healthy food in school	-The taste vegetables activity - Add in the knowledge documentation of "Let me know the five major food"
8. Replace watching TV with engaging in an enjoyable physical activity; relaxation techniques. (Beth Yano, Ebesutani, & Choy, 2009)	- Exercise in the morning, lunch time, after school at school and their home, and the vegetables planting in school	-The activity of the planting the vegetables in their home -Add in homework "Let's grow vegetables"
9. Collect the data e g. increase in fruits intake, decrease in sugar intake, increase in physical activity, decreases in sedentary behaviors. (Beth Yano, Ebesutani, & Choy,2009)	- Recording the eating and exercise questionnaire of students	-The note book for record the nutritional status, dietary intake and physical activity -Add in the "Notes of my nutrition and exercise" -Add in the knowledge document "The type and energy of food" and "Energy and exercise"
10.The contents of these lectures included health consequences of childhood obesity, the food pyramid, increase the consumption of fruits and vegetables among children	- Healthy food in school and Recording the eating questionnaire of students	-The content of food 5 components and nutrition flag -Have the note book for 3 day food record -Add in knowledge document "Let's know 5 food components" -Add in the "Notes of my nutrition and exercise"

Table 4-6 The student activities from literature review and 4 DLHPSs to the obesity control program (cont.)

Activities from literature review /Author	Activities from 4 DLHPSs	Apply the activities in program protocol
enrolled in the intervention. (Eisenmann et al., 2008; Jiang et al., 2007)		-Add in knowledge document "Let's know 5 food components" -Add in the "Notes of my nutrition and exercise"
11.The intervention aimed to increase physical activity as well by exercise. (Jiang et al., 2007)	- Exercise in the morning, lunch time, after school at school and their home	- The aerobic dance in morning -Add the aerobic dance in morning
12.Weight and height were measured for students in the intervention schools twice each semester. -Have flow graph of obesity changes from baseline to end line in children in intervention and control schools. - Anthropometric measurements were taken every 2 weeks. (Jiang et al., 2007)	- Nutritional status assessment for student	-Anthropometric assessment in students that is waist circumference, fat percentage at triceps and sub-scapular by use skinfold caliper -Record in the "Notes of my nutrition and exercise"
13.The several childhood obesity intervention shave taken place is in after school or summer camp programs. (Boon & Clydesdale, 2005)	- Healthy day and healthy corner	-The healthy camp or activity day by set for 1 day
14.Education-based intervention discouraging the consumption of carbonated beverages, encouraging fruits intake, and promoting the consumption of water.(Doak, Visscher, Renders, & Seidell,2006)	-Provide the healthy knowledge to students, and Healthy food	- The example of the healthy food and such as vegetables and the food that should be avoid such as soft drink -Add in the Knowledge documentation of "Danger of obesity and protection" And Knowledge documentation of "Danger of carbonate drink"

3.2 Parents

Table 4-7 The parent activities from literature review and 4 DLHPSs to the obesity control program

Activities from literature review /Author	Activities from 4 DLHPSs	Apply the activities in program protocol
1. The program is designed to make it easier for families to plan meals, include healthy snacks.(Eisenmann et al., 2008)	-Provide the healthy knowledge to parents	-The content of the dangerous snack and nutrition label -Add in knowledge document "Healthy snack, dangerous soft drink and snack"
2.Offer public education/training workshops for parents. (Eisenmann et al., 2008)	-Provide the healthy knowledge to parents	-The meeting and nutrition education in parents group
3. Teach a 'traffic light' food item list was given to the parents to help children decrease their energy intake and consume a balanced diet. (Jiang et al., 2007)	-Provide the healthy knowledge to parents	-The content of nutrition label -Add in manual "Obesity and prevention"
4. The parents' baseline survey measured the target child's media habits, physical activity, amount of sleep, snacking habits, the target child's fruits and vegetables consumption. (Eisenmann et al., 2008)	-Recording the eating and exercise questionnaire of their children	-The note book for record the physical activity and the example of energy in each activity (From the activity, the parent can help the student for recording) -Add in the "Notes of my nutrition and exercise" and the knowledge documentation "The energy used in each category"
5. Have the newsletters been sent to families to encourage them to help their children reach their goals, and each family received an electronic television time manager.(Boon & Clydesdale, 2005; Howard, 2007)	-Provide the healthy knowledge to parents	-The newsletter about obesity control knowledge to parents

Table 4-7 The parent activities from literature review and 4 DLHPSs to the obesity control program (cont.)

Activities from literature review /Author	**Activities from 4 DLHPSs**	**Apply the activities in program protocol**
6. Increases the potential of children to walk and the possibility of parents exercise with children at home. (DeMattia, Lemont, & Meurer, 2012)	- Exercise in the morning, lunch time, after school at school and their home	-The vegetables plant at students home. Parents help student plant the vegetables -Add the vegetables plant at students home in the activity "Let's grow vegetables"
7. They proposed that interventions should be based on positive actions and role modeling by parents. Parents should be encouraged to provide a wide variety of healthy choices for their children and to allow considerable latitude in making decisions about food choices and quantity. (Howard, 2007)	- Healthy food , and Recording the eating and exercise questionnaire of their children	-The food and physical activity questionnaire and note for parent and children. -Add in knowledge Documentation "Obesity and prevention" and add in the "Notes of my nutrition and exercise"
8. The ''Parental Perceptions of Body Mass Index and Obesity in School-Age Children'' survey was used in this study with permission. (Stalter, Kaylor, Steinke, & Barker, 2010)	-	-Create the perceptions of obese children questionnaire for parent

3.3 Teachers

Table 4-8 The teacher activities from literature review and 4 DLHPSs to the obesity control program

Activities from literature review /Author	Activities from 4 DLHPSs	Apply the activities in program protocol
1. Teachers were provided the opportunity to integrate some of the contents into their classroom. (Eisenmann et al., 2008)	-Integrate the obesity control content into all subjects to students	-Integrate the obesity control contents to all subjects

3.4 Food cookers

Table 4-9 The food cookers activities from literature review and 4 DLHPSs to the obesity control program

Activities from literature review /Author	Activities from 4 DLHPSs	Apply the activities in program protocol
1. Emphasis was placed on reducing the intake of fast food, drinks containing sugar and sweets, and on increasing the intake of vegetables, fruits and whole-grain bread. (Gronbaek, Madsen, & Michaelsen, 2009)	-Inform the healthy knowledge to food cookers	-The nutrition education about the type of food and calculation the food energy in 1 day and have the example of food energy and energy using -Add in the knowledge documentation of knowledge “The type and energy of food”
2. The activities, there were changes to the intervention school’s food service including replacing the deep frying equipment with baking ovens. (Greening, Harrell, Low, & Fielder, 2011)	-Inform the healthy knowledge to food cookers	-The nutrition education for food cookers about the healthy lunch menu and energy of Thai dessert -Add in the knowledge documentation of “The healthy menu setting”

The conclusion in detail of obesity control activities between interview from 4 DLHPSs and literature review from articles could conclude and present the activities content as 8 main activities as follows:

1. Nutrition education for students, parents and food cookers
2. Healthy food for students
3. Exercise in the morning for students
4. Healthy camp for students
5. Teachers meeting for integration of nutrition contents to all subjects
6. Newsletter for parents
7. Plant the vegetables at school or home for students
8. Nutrition assessment, physical activity and perceptions assessment for students/parents and physical fitness assessment for students

Part II: Program development

After finishing part I situation analysis, the researcher bring the content that receive from In-depth interview and focus group of 4 DLHPSs to analyze and present in setting area or Christasongkroc School.

1. The participants' cooperation

The program planning was created by participants in order to set the activities of obesity control program by themselves. The participants compounded of students, teachers, and parents. The A-I-C technique was use in this step for creating awareness, collaboration in participant group and set activity for controlling obesity in students. The participants' cooperation consisted of activities as follows.

1) Group meeting. The researcher divided participants into 3 groups including the students, teachers, and parents.

All selected students were overweight and obesity studying in elementary school grade 1-3. Sixty and seven students participated in the group

meeting including the grade 1, 2, 3 were 20, 22, and 25 respectively. The student group meeting was held at meeting room on 6 August, 2012.

The parents who had overweight and obese student grade 1-3 were included. Thirty two parents participated in the group meeting. The parent group meeting was held at meeting room on 10 August, 2012.

The teachers who were responsibility in each subjects and school health in school were also included. Nine teachers participated in the group meeting. The teacher group meeting was held at meeting room on 16 August, 2012.

2) Identify problems and factor of obesity in students. Students, teachers and parents brainstorm the problems and factor of obesity in students. The problems of obesity in students were obesity in students that affect to chronic disease in the future. The first factor of obesity in students was unhealthy food eating that was fat, sweet, salt food. Students like eating snack, soft drink and didn't like vegetables. The other factors are stagnant activities including the watching television and playing computer game that support to obesity in students.

3) The A-I-C technique consisted of activities as follows.

Step 1: Appreciation; share ideas and discussion

The participants in this step included students, parents, and teachers. Drawing the child's body shape in reality and future according to ideal vision was help to present the wish of owner. The picture of child's body shape in the future of all participants was a slim children or normal nutritional status of children.

Step 2: Influence; identify the best development activities or project and set their own development priorities.

The participants created the activities according to their idea after that the researcher presented the activities in obesity control program of DLHPS and review literature to participant group. The researcher concluded the activities again by information the activities of other groups (If this group is parent group, the researcher will show the activities that children thought to parent group). Most of activities of 3 groups had harmony each other.

Step 3: Control; action plan setting flam and responsibility.

The researcher and participants help to preparation of the implementation plan and identification of the responsible persons who implement the plan.

The researcher and participants arranged and set a date, number and place of activity for planning.

From the A-I-C technique, the researcher could conduct the activities in the obesity control program as Table 4-10.

2. The program of the obesity control program in elementary school student

According to A-I-C technique from participants and review literature referred to the many activities as Table 4-10.

Table 4-10 The program of the obesity control program in school

Name of activity	The partici-pants	The activities content	Number of activities	Responsibi - lity
1. Nutrition education	Students	-Have the nutrition education time -Teach the knowledge and workshop included the danger of obesity, healthy and unhealthy food, energy from food, benefit of exercise and energy, plant the vegetables, and nutrition label. -These topic had the contents of goal setting for the future, the hazard of obesity, food 5 components and nutrition flag, role model in school, the moving the disadvantage food from the kitchen, and taste vegetables activity by put in the documents of knowledge and activities.	6 times/ 4 months	Researcher
	Parents	-Teach the content for parent group same the student group by focus on practice for care their children when stay at home.	2 times/ 4 months	Researcher
	Food cookers	-Teach the content for food cooker group same the student group by focus on practice for care their children included the preparing food and portion size of food. -These content details of 3 groups were explained in Appendix B.	4 times/ 4 months	Researcher
2.Healthy food	Students	- Launch the healthy food in school by addition the fruits and vegetable in lunch meal and food in school. -Low sugar, fat, and salt food in cafeteria	Through the project	Researcher, teachers, food cookers and parents

Table 4-10 The program of the obesity control program in school (cont.)

Name of activity	The partici-pants	The activities content	Number of activities	Responsibi-lity
2.Healthy food (cont.)		-Addition the healthy menu such as dessert in school		
3.Exercise in the morning	Students	-Exercise in the morning	1 month	Researcher and teacher
4.Healthy day/ Healthy corner	Students	-Set activities for practice and teach knowledge to students -Establish healthy corner in school	1 day 1 month	Researcher and teacher team
5.Teacher meeting	Teachers	-Meeting the teacher for follow the activities in school and integration of nutrition contents to all subjects	Meeting 4 times/4 months	Researcher and teacher
6.Newsletter	Parents	-Inform the activities, knowledge about obesity control program by using newsletter	Send 5 times/4 months	Researcher
7.Plant the vegetables at home	Students Parents	-Plant the vegetables at school or student's home -Parents helped students plant vegetables in their home	1 month	Researcher and parents
8.Nutrition assessment and Physical fitness assessment	Students Parents	-Assessment the consumption, exercise behavior in students and parents -Assessment the physical fitness, body fat percentage , waist circumference, fat percentage at triceps, and subscapular by use skinfold caliper in students - Perceptions of obese children questionnaire in students and parents	3 times	Researcher, parents, and students

According to aforementioned table 4-10 the program of the obesity control program in elementary school student, could conclude to the diagram of embedded design in type of experimental model as Figure 4-5.

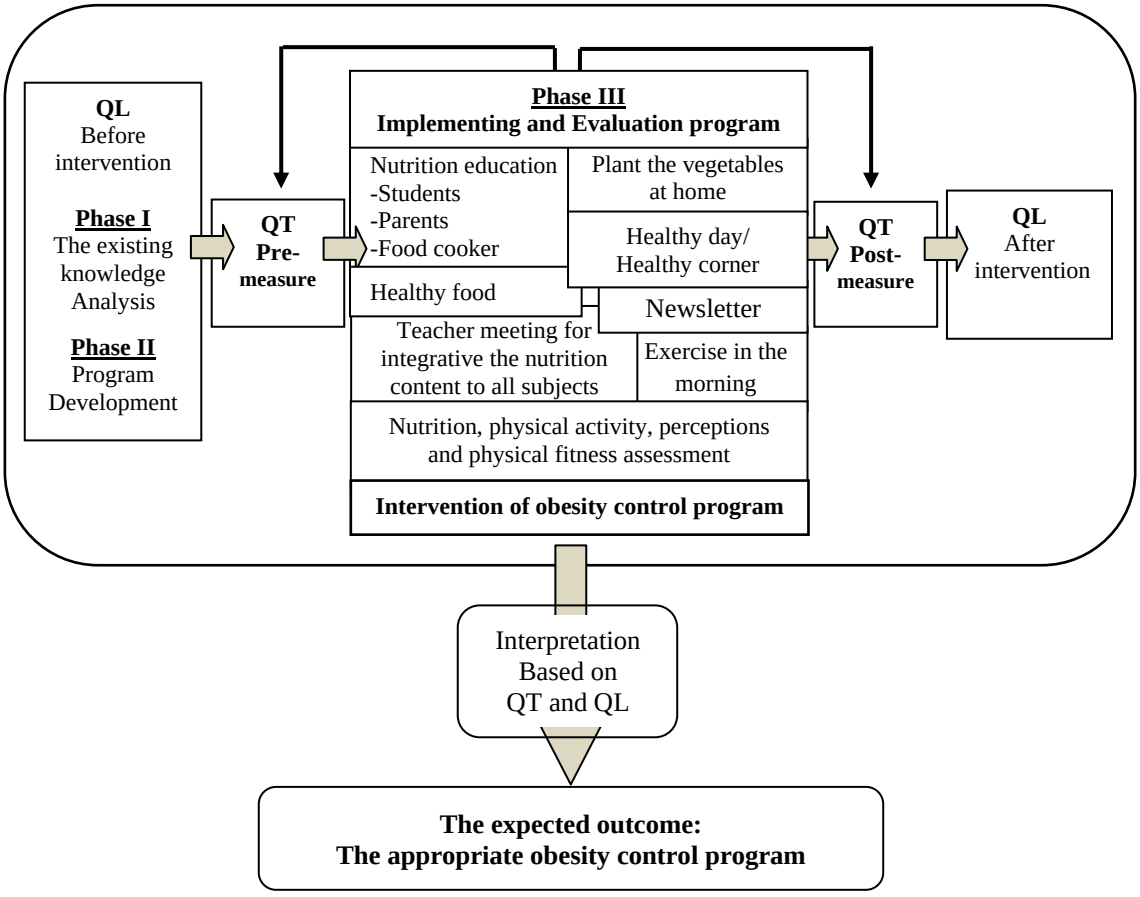

Figure 4-5: Represent the diagram of process follow the embedded experimental research design

Eight activities were performed in Phase II. The activities could describe in below content and these have more details in Appendix B. The 8 activities were concluded as follows:

1) Nutrition education

Nutrition education was performed for 3 participation groups (students, parents, and food cookers). The contents for nutrition education composed of 6, 2, and 4 topics in students, parents, and food cookers, respectively. The topics of nutrition education program had content about the knowledge and workshop such as the obesity

and obesity assessment, the five food components, the quantity and energy of food, the vegetables planting, energy expenditure and exercise, the knowledge of nutrition label and danger of carbonate drink and snack, and the school lunch arrangement for normal weight in students as showed in Appendix B.

2) Healthy food

The healthy food activity was emphasized on vegetables and fruits consumption. Low sugar in fruits juice, reducing the seasoning and fat food in school lunch meal and school were the main concept for healthy food in school. The building knowledge by nutrition education was conducted in food cookers for healthy food at school, and in parents for healthy food at home.

3) Teacher meeting for integrative the nutrition content to all subjects

The activity that performed with teacher was integration the obesity control content in all subjects. Eight teachers were represent teacher from each subject who taught in Grade 1-3 including the 1) Mathematics, 2) Thai language, 3) English language, 4) Arts, 5) Social, 6) Science, 7) Nutrition education and physical, and 8) Home working and technology. Four meeting of teachers in each subject occurred in this program. The detail of meeting was represented as Appendix B.

4) Nutrition, physical activity, perceptions and physical fitness assessment

Nutrition, physical activity, perceptions, and physical fitness assessment were assessed for three times by questionnaire as Appendix C. For physical fitness assessment was measured by Sports Authority of Thailand Simplified Physical Fitness Test, SATST for test the basic physical performance of people over 7 years old. The physical fitness included 5 activities as 1) push-ups 30 seconds, 2) sit-ups 60 seconds, 3) sit and reach test, 4) standing broad jump, and 5) zig-zag.

5) Plant the vegetables at home

Plant the vegetables at home was one activity in topic of nutrition education. The vegetables planting topics had the main objective to increase the

knowledge of vegetables planting in their home. The seed of 2 vegetables was distributed to students for planting. The researcher would follow this progress by asking in the nutrition education class. Some students brought the vegetables for food cooking.

6) Healthy day/Healthy corner

The healthy day was the extra activity that included the knowledge and game about obesity control program such as healthy game and healthy exhibition.
The activity objectives were to enhance the skill and awareness of obesity prevention in students. This activity was done by researcher and teacher team for 3 hours. Healthy corner was one activity for knowledge increasing. The corner in cafeteria was set to healthy corner. The detail of this activity was showed in Appendix B.

7) Newsletter

The obesity control program information was communicated by newsletters. The newsletters helped parents agree and understand in activities and program of obesity. Sevens newsletter was sent to parent by students. The contents of newsletters were represented in Appendix B.

8) Exercise in the morning

The exercise in the morning was the one of activity that performed in obesity control program. One month for this activity, the period of time for exercise in the morning was 10 minutes per day. The song of was support from Department of Health, Ministry of Public Health. The songs included the “Food dance”, “Food consumption” and , “Fit Nae” . The pattern of activity was assigned by students, research team and education teacher. The objective, activity, and outcome of this activity were represented in Appendix B.

The interpretation of phase III: Implementing and evaluation program was conducted in setting school or Christasongkroc School. When comparing between the activities that came from 4 DLHPSs and the final of obesity control program, the result found that some activity of obesity control program differed from 4 DLHPSs

such as nutrition education, vegetables planting at home, newsletter, and perception, physical fitness, waist circumference, skinfold thickness assessment.

Moreover, the activities between DLHPS /review literature and real activity that conducted in setting school had a few difference with obesity control program in setting school. Some activity such as the vegetables planting and healthy food was informed by modification. The vegetables planting could perform at home, but couldn't plant at school because of unavailable area in school because plant area in school was flooding area. The vegetables planting couldn't plant at school because plant area in school has been flooded areas. Healthy food strategy in school DLHPS could ban the seasoning in cafeteria, but setting school could reduce the seasoning in cafeteria. The obesity control program was the short time period activity. Therefore, all parties such as school director, teachers, food cookers, parents, and students were the key person for health project continuation in order to obesity controlling in school.

Part III: Implementing and Program Evaluation

The obesity control program for this study was developed based on the program obesity control from the DLHPS and the setting school that the researcher implements and evaluates the program. The period of time in this part was performed for 4 months. The experimental group came from Christasongkroc School by participation of students, teachers, parents, and food cookers. The control school was Malasawan pittaya. Both of schools could represent the obesity control program testing. The results from this part could conclude the effectiveness of program. The contents of this part were separate for 3 parts that are the evaluation of the participation in obesity control program and the opinion after completing the obesity control program. The participation of this study could separate for 4 groups, including the 1) students, 2) parents, 3) teachers, 4) food cookers, and 5) school directors. The sequence of contents in this Part III could explain as follows:

1. The evaluation of participation in obesity control program
    - 1.1 Students
    - 1.2 Parents

2. The opinion after completing the obesity control program

2.1 Collaboration

2.2 Satisfaction

3. The effectiveness of obesity control program

1. The Evaluation of participation in obesity control program

The obesity control program was evaluated by many items by starting in the experimental and control group as follows:

For students:

-Characteristics of students in 3 nutritional status groups

-Perception of their obesity

-Consumption behavior such as the frequency of meal consumption, the type and frequency of snack or food between meal consumption per week, healthy and unhealthy food frequency per week, the food frequency questionnaire for children in school (24 hour recall), and the carbohydrate, protein, and fat of dietary intake per day

-Physical activities and exercise behavior such as the energy expenditure per day of their obesity, and the physical fitness

-Nutritional status

-Adiposity outcome and body fat percentage

The obesity control program was assessed the effectiveness by comparison between experimental and control group as follows:

- Characteristics of students in 2 groups
- Perception of their obesity
- Calories of dietary intake per day
- Energy expenditure per day
- Body fat percentage

For parents:

They were evaluated in both of the parent in experimental and control students such as the characteristics of parents in 3 nutritional status groups, the

perception of obesity in their child, the consumption behavior especially the food frequency questionnaire (24 hour recall), the physical activities and exercise behavior

The opinion after completing the obesity control program in students, parents, teachers, food cookers, and school director about collaboration and satisfaction after finish program was revealed in the final part.

1. Student

1.1 Experimental students

1.1.1 Background characteristics of participants

The participants were 40 overweight students (grade 1 to 3 students). All students were measured on weight and height by researcher.

Table 4-11 Characteristics of students in 3 nutritional status groups (n=40)

Characteristics	Students nutritional status							
	At risk of overweight		Overweight		Obesity		Total	
	n	%	n	%	n	%	n	%
Total	5	100.0	17	100.0	18	100.0	40	100.0
Sex								
Boy	4	80.0	12	70.6	10	55.6	26	65.0
Girl	1	20.0	5	29.4	8	44.4	14	35.0
Age (years)								
6	0	0.0	1	5.9	3	16.7	4	10.0
7	2	40.0	4	23.5	6	33.3	12	30.0
8	3	60.0	3	17.7	5	27.8	11	27.5
9	0	0.0	4	23.5	4	22.2	8	20.0
10	0	0.0	5	29.4	0	0.0	5	12.5
Mean ± SD	7.60 ± 0.54		8.47 ± 1.33		7.56 ± 1.04		7.95 ± 1.19	
Educational level								
Grade 1	1	20.0	6	35.3	7	38.9	14	35.0
Grade 2	2	40.0	4	23.5	6	33.3	12	30.0
Grade 3	2	40.0	7	41.2	5	27.8	14	35.0

The study subjects were students who had been in the level of nutritional status since at risk of overweight to obesity. Table 4-11 presented characteristics of students in 3 groups found that the majority of subjects (65.0%) were boy. For age distribution, the obesity group was younger than at risk of overweight and overweight groups. Regarding education level, about 70% of subjects had attained grade 1 and 3.

1.1.2 Perception of their obesity

Perception of their obesity consisted of 6 dimensions, which were prior health, current health, health outlook, resistance and susceptibility to illness, health worry and concern, and sickness orientation.

Table 4-12 Description of respondent's health perception of their obesity in 3 nutritional status groups (n=40)

Respondent's health perception of their obesity	Students nutritional status							
	At risk of overweight		Overweight		Obesity		Total	
	n	%	n	%	n	%	n	%
Time 1								
Total	5	100.0	17	100.0	18	100.0	40	100.0
Poor level	0	0.0	3	17.7	2	11.1	5	12.5
Moderate level	1	20.0	9	52.9	13	72.2	23	57.5
Good level	4	80.0	5	29.4	3	16.7	12	30.0
Mean ± SD	14.40 ± 1.51		12.11 ± 2.97		12.28 ± 1.95		12.46 ± 2.43	
Time 2								
Total	8	100.0	13	100.0	19	100.0	40	100.0
Poor level	2	25.0	1	7.6	0	0.0	3	7.5
Moderate level	1	12.5	6	46.2	12	63.2	19	47.5
Good level	5	62.5	6	46.2	7	36.8	18	45.0
Mean ± SD	12.75 ± 3.53		13.30 ± 2.01		13.36 ± 1.67		13.23 ± 2.16	
Time 3								
Total	8	100.0	19	100.0	13	100.0	40	100.0
Poor level	0	0.0	0	0.0	1	7.7	1	2.5
Moderate level	4	50.0	10	52.6	8	61.5	22	55.0
Good level	4	50.0	9	47.4	4	30.8	17	42.5
Mean ± SD	14.50 ± 2.43		13.42 ± 2.14		11.93 ± 2.23		13.26 ± 2.24	

Mean score between 6-9 means the student's perception of their obesity was poor level, between 10-13 was moderate level, and between 14-18 was good level.

As shown in table 4-12, about 57.5%, 47.5%, and 55.0% in Time 1, 2, and 3 of three student groups had respondent's health perception of their obesity in moderate level. When considered in 3 times of collected data that was before program intervention (Time 1), during program intervention (Time 2), and immediately after program intervention (Time 3), it was found that mean of respondent's health perception of their obesity in Time 3 higher than time 2, and score in Time 2 was higher than time 1, 13.26 ± 2.24, 13.23 ± 2.16, and 12.46 ± 2.43, respectively.

1.1.3 Consumption behavior

Consumption behavior of students was assessed in term of the frequency of meal consumption, snack or food between meal consumption per week, and calories of dietary intake per day.

1.1.3.1 Frequency of meal consumption

Table 4-13 Description of the frequency of meal consumption of their obesity in 3 nutritional status groups (n=40)

Meal/ Time	Consumption behavior					
	Study day (n=40)			Holiday (n=40)		
	Every day	Some day	None	Every day	Some day	None
Breakfast						
Time 1	23(57.5)	15(37.5)	2(5.0)	28(70.0)	11(27.5)	1(2.5)
Time 2	21(52.5)	14(35.0)	5(12.5)	28(70.0)	10(25.0)	2(5.0)
Time 3	22(55.0)	14(35.0)	4(10.0)	28(70.0)	10(25.0)	2(5.0)
Lunch						
Time 1	33(82.5)	7(17.5)	0(0.0)	24(60.0)	13(32.5)	3(7.5)
Time 2	30(75.0)	9(22.5)	1(2.5)	24(60.0)	9(22.5)	7(17.5)
Time 3	36(90.0)	4(10.0)	0(0.0)	25(62.5)	11(27.5)	4(10.0)
Dinner						
Time 1	28(70.0)	10(25.0)	2(5.0)	29(72.5)	10(25.0)	1(2.5)
Time 2	25(62.5)	11(27.5)	4(10.0)	29(72.5)	8(20.0)	3(7.5)
Time 3	26(65.0)	11(27.5)	3(7.5)	29(72.5)	9(22.5)	2(5.0)

Table 4-13 Description of the frequency of meal consumption of their obesity in 3 nutritional status groups (n=40) (cont.)

Meal/ Time	Consumption behavior					
	Study day (n=40)			Holiday (n=40)		
	Every day	Some day	None	Every day	Some day	None
Snack before breakfast						
Time 1	9(22.5)	26(65.0)	5(12.5)	13(32.5)	25(62.5)	2(5.0)
Time 2	13(32.5)	17(42.5)	10(25.0)	10(25.0)	22(55.0)	8(20.0)
Time 1	12(30.0)	19(47.5)	9(22.5)	18(45.0)	16(40.0)	6(15.0)
Snack mid morning						
Time 1	23(57.5)	15(37.5)	2(5.0)	7(17.5)	27(67.5)	6(15.0)
Time 2	21(52.5)	14(35.0)	5(12.5)	9(22.5)	18(45.0)	13(32.5)
Time 3	22(55.0)	14(35.0)	4(10.0)	11(27.5)	19(47.5)	10(25.0)
Snack mid afternoon						
Time 1	11(27.5)	20(50.0)	9(22.5)	13(32.5)	18(45.0)	9(22.5)
Time 2	9(22.5)	20(50.0)	11(27.5)	8(20.0)	21(52.5)	11(27.5)
Time 3	10(25.0)	18(45.0)	12(30.0)	7(17.5)	22(55.0)	11(27.5)
Snack after dinner						
Time 1	10(25.0)	20(50.0)	10(25.0)	10(25.0)	20(50.0)	10(25.0)
Time 2	6(15.0)	20(50.0)	14(35.0)	3(7.5)	23(57.5)	14(35.0)
Time 3	10(25.0)	10(25.0)	20(50.0)	7(17.5)	18(45.0)	15(37.5)

Table 4-13 showed the overview of meal consumption. Frequency of meal consumption indicated that most of students consumed meal in breakfast, snack mid morning, lunch, and dinner for everyday in study day. In holiday, most of students consumed three meals including breakfast, lunch, and dinner. For the snack in mid morning, it was consumed in study day higher than holiday.

1.1.3.2 Type and frequency of snack or food between meal consumption per week

Table 4-14 Description of type and frequency of snack or food between meal consumption per week of 3 nutritional status groups (n=40)

Type of snack/ food	Frequency of consumption (n=40)				
	None	Every day	Always (4-6 times/wk.)	Some times (1-3 times/wk.)	Hardly (2-3 times/mo.)
Thai dessert					
Time 1	17(42.5)	4(10.0)	3(7.5)	11(27.5)	15(12.5)
Time 2	14(35.0)	2(5.0)	5(12.5)	9(22.5)	10(25.0)
Time 3	16(40.0)	5(12.5)	5(12.5)	6(15.0)	8(20.0)
Bakery					
Time 1	10(25.0)	11(27.5)	7(17.5)	8(20.0)	4(10.0)
Time 2	12(30.0)	5(12.5)	6(15.0)	11(27.5)	6(15.0)
Time 3	12(30.0)	8(20.0)	4(10.0)	11(27.5)	5(12.5)
Snack					
Time 1	4(10.0)	17(42.5)	4(10.0)	12(30.0)	3(7.5)
Time 2	3(7.5)	13(32.5)	9(22.5)	12(30.0)	3(7.5)
Time 3	5(12.5)	17(42.5)	9(22.5)	6(15.0)	3(7.5)
Candy and chocolate					
Time 1	18(45.0)	3(7.5)	3(7.5)	10(25.0)	6(15.0)
Time 2	11(27.5)	7(17.5)	7(17.5)	6(15.0)	9(22.5)
Time 3	16(40.0)	7(17.5)	5(12.5)	9(22.5)	3(7.5)

Table 4-14 Description of type and frequency of snack or food between meal consumption per week of 3 nutritional status groups (n=40) (cont.)

Type of snack/ food	Frequency of consumption (n=40)				
	None	Every day	Always (4-6 times/wk.)	Some times (1-3 times/wk.)	Hardly (2-3 times/mo.)
Fast food					
Time 1	8(20.0)	12(30.0)	9(22.5)	9(22.5)	2(5.0)
Time 2	6(15.0)	10(25.0)	8(10.0)	9(22.5)	7(5.0)
Time 3	6(15.0)	12(30.0)	10(25.0)	3(7.5)	9(22.5)
Soft drink					
Time 1	4(10.0)	9(22.5)	10(25.0)	12(30.0)	5(12.5)
Time 2	9(22.5)	9(22.5)	6(15.0)	10(25.0)	6(15.0)
Time 3	9(22.5)	12(30.0)	10(25.0)	6(15.0)	3(7.5)
Fruits juice					
Time 1	2(5.0)	22(55.0)	8(20.0)	7(17.5)	1(2.5)
Time 2	2(5.0)	25(62.5)	6(15.0)	6(15.0)	1(2.5)
Time 3	2(5.0)	23(57.5)	9(22.5)	5(12.5)	1(2.5)
Fruits					
Time 1	2(5.0)	23(57.5)	6(15.0)	7(17.5)	2(5.0)
Time 2	6(15.0)	21(52.5)	7(17.5)	6(15.0)	0(0.0)
Time 3	5(12.5)	23(57.5)	9(22.5)	2(5.0)	1(2.5)

Table 4-14 showed type and frequency of snack or food between meal consumption per week of 3 nutritional status groups. The results found that most students consumed snack, fast food, soft drink, fruits juice, and fruits in everyday. For the Thai dessert, bakery, and candy and chocolate, were not consumed by most students.

1.1.3.3 Type and frequency of snack or food between meal consumption per week

Table 4-15 Description of the healthy and unhealthy food frequency per week of 3 nutritional status groups (n=40)

Time	Frequency of consumption*	
	Healthy food [a]	Unhealthy food [b]
Time 1	66 (55.0%)	85 (42.5%)
Time 2	66 (55.0%)	80 (40.0%)
Time 3	74 (61.7%)	94 (47.0%)

* Frequency of consumption especially consumed every day and always (4-6 times/wk.)

[a] Healthy food: Thai dessert, Fruits juice, and Fruits

[b] Unhealthy food: Bakery, Snack, Candy and chocolate, fast food, and Soft drink

When considering especially the frequency of healthy and unhealthy food, the Table 4-15 presented the healthy and unhealthy food frequency per week of 3 nutritional status groups. The results showed that frequency of healthy food consumption in every day or always (4-6 times/wk.) was increased from Time 2 and Time 3, but Time 1 and Time 2 was equal to frequency of consumption, while the frequency of unhealthy food consumption was decreased in Time 1 and Time 2, but it increased at Time 3.

Table 4-16 showed the average of the calories of dietary intake per day at 3 times of all groups. The results showed that it decreased from Time 1 to Time 2, and Time 2 to Time 3 in all groups of nutritional status students.

The nutrients of dietary intake per day such as carbohydrate, protein, and fat were calculated for comparing in 3 times as Table 4-17. In at risk of overweight group found that carbohydrate and fat intake per day decreased from Time 1 to Time 3, while protein intake per day decreased from Time 1 to Time 2, and it increased at Time 3. For overweight group found that fat and protein intake per day decreased from Time 1 to Time 3, while carbohydrate intake per day decreased from Time 1 to Time 2, and it increased at Time 3. For obesity group

found that all nutrients intake per day decreased from Time 1 to Time 2, and it increased at Time 3.

1.1.3.4 Food frequency questionnaire for children in school (24 hour recall)

Table 4-16 Description of the calories of dietary intake per day in 3 nutritional status groups (n=40)

Students nutritional status	Calories of dietary intake per day (Kcal)			Total	$\overline{X}$ ± SD
	500-1000	1001-1500	1501-2000		
At risk of overweight					
Time 1	1(20.0)	3(60.0)	1(20.0)	5(100.0)	1298.9±217.4
Time 2	2(25.0)	6(75.0)	0(0.0)	8(100.0)	1111.1±262.2
Time 3	4(50.0)	4(50.0)	0(0.0)	8(100.0)	981.6±256.8
Overweight					
Time 1	2(11.8)	12(70.6)	3(17.6)	17(100.0)	1255.2±242.3
Time 2	6(46.2)	7(53.8)	0(0.0)	13(100.0)	1032.1±225.5
Time 3	13(68.4)	6(31.6)	0(0.0)	19(100.0)	901.5±272.8
Obesity					
Time 1	2(11.1)	9(50.0)	7(38.9)	18(100.0)	1363.8±324.6
Time 2	12(63.2)	7(36.8)	0(0.0)	19(100.0)	979.3±263.2
Time 3	11(84.6)	2(15.4)	0(0.0)	13(100.0)	818.0±226.4

Moreover, the carbohydrate intake per day of students was lower than Thai RDI (210 grams); however, fat and protein intake per day was similar with Thai RDI criteria (Fat = 45 grams, Pro = 35 grams), as shown in Figure 4-6.

1.1.3.5 Carbohydrate, protein, and fat of dietary intake per day

Table 4-17 Description of carbohydrate (CHO), fat (FAT), and protein (PRO) from dietary intake per day of 3 nutritional status groups (n=40)

Students nutritional status	**Nutrients from dietary intake per day (g.)**		
	CHO	FAT	PRO
At risk of overweight			
Time 1	155.9 ± 88.7	58.5 ± 35.9	51.4 ± 23.5
Time 2	152.7 ± 94.6	44.4 ± 31.3	35.5 ± 14.3
Time 3	79.7 ± 18.0	43.9 ± 27.9	53.5 ± 39.9
Overweight			
Time 1	149.0 ± 80.6	50.5 ± 21.9	54.5 ± 35.9
Time 2	78.4 ± 25.7	44.9 ± 26.7	44.9 ± 26.8
Time 3	107.9 ± 43.6	32.2 ± 14.6	35.9 ± 17.2
Obesity			
Time 1	142.9 ± 57.9	45.2 ± 22.9	51.2 ± 27.9
Time 2	108.7 ± 76.8	31.8 ± 17.7	38.8 ± 16.6
Time 3	130.8 ± 105.1	32.5 ± 20.8	45.2 ± 24.5

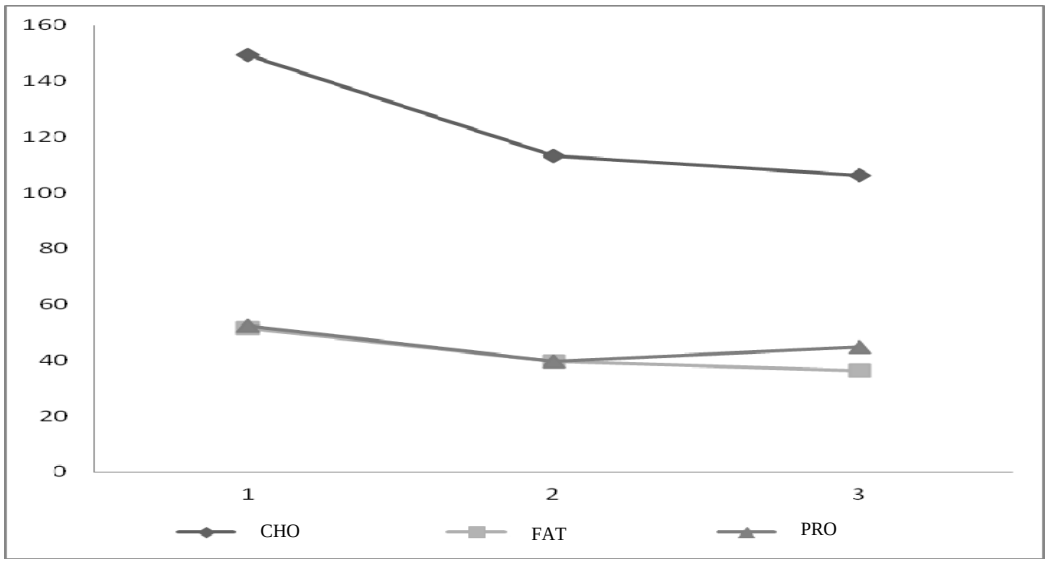

Figure 4-6: Comparison the nutrients between Thai RDI criteria and nutrients from dietary intake per day of experimental group

1.1.4 Physical activities and exercise behavior

The energy expenditure of physical activity and exercise per day of students were showed in Table 4-18. The mean of the energy expenditure per day at 3 times was found that the energy expenditure per day in at risk of overweight and obesity group were increased from Time 1 to Time 2, and Time 2 to Time 3. For overweight group, the mean of the energy expenditure per day was increased from Time 1 to Time 2, but it dropped at Time 3.

Table 4-18 Description of energy expenditure per day of 3 nutritional status groups (n=40)

Students nutritional status	Energy expenditure per day (Kcal)			Total	$\overline{X}$ ± SD
	500-1000	1001-1500	1501-2000		
At risk of overweight					
Time 1	1(20.0)	4(80.0)	0(20.0)	5(100.0)	1207.0± 206.1
Time 2	1(12.5)	6(75.0)	1(12.5)	8(100.0)	1287.8±179.7
Time 3	0(0.0)	4(66.7)	2(33.3)	6(100.0)	1459.1±275.6
Overweight					
Time 1	6(35.3)	9(52.9)	2(11.8)	17(100.0)	1190.5±298.3
Time 2	2(15.4)	8(61.5)	3(23.1)	13(100.0)	1319.3±271.9
Time 3	1(5.3)	14(73.7)	4(21.1)	19(100.0)	1315.6±244.1
Obesity					
Time 1	5(27.8)	9(50.0)	4(22.2)	18(100.0)	1239.2±295.9
Time 2	3(15.8)	12(63.2)	4(21.1)	19(100.0)	1243.2±301.6
Time 3	0(0.0)	8(61.5)	5(38.5)	13(100.0)	1428.0±301.7

Table 4-19 showed the physical fitness examination of 3 nutritional status groups. The physical fitness examination were examined by push-ups 30 seconds, sit-ups 60 seconds, sit and reach, standing broad jump, and zig-zag run. The trend of these activities in each time was better changing. When considered physical fitness examination between Time 1 vs Time 2 and Time 1 vs Time 3 found that the students was better in all physical fitness types than baseline.

1.1.5 Physical fitness

Table 4-19 Description of physical fitness examination of 3 nutritional status groups (n=40)

Type of physical fitness	Changing (n)		
	Better	**Lower**	**Equal**
Push-ups 30 seconds (Times)			
Time 1 vs Time 2	29	1	10
Time 1 vs Time 3	35	3	2
$\overline{X}$ ± SD; Time 1= 7.7±5.3, Time 2=11.0±7.8, Time 3= 12.7±7.7			
Sit-ups 60 seconds (Times)			
Time 1 vs Time 2	24	5	11
Time 1 vs Time 3	32	3	5
$\overline{X}$ ± SD; Time 1= 5.0±4.6, Time 2= 9.0±4.8, Time 3= 12.6±6.9			
Sit and reach (Centimeters)			
Time 1 vs Time 2	17	12	11
Time 1 vs Time 3	23	12	5
$\overline{X}$ ± SD; Time 1 = -1.5±6.6, Time 2 = -1.3±7.5, Time 3 = -0.4±7.2			
Standing broad jump (Centimeters)			
Time 1 vs Time 2	17	16	7
Time 1 vs Time 3	19	15	6
$\overline{X}$ ± SD; Time 1= 100.9±15.6, Time 2= 100.0±13.9, Time 3= 101.6±15.5			
Zig-Zag Run (Seconds)			
Time 1 vs Time 2	26	14	0
Time 1 vs Time 3	28	12	0
$\overline{X}$ ± SD; Time 1=26.4±3.3, Time 2= 25.7±2.5, Time 3= 24.9±2.6			

Better =Improvement in physical fitness examination
Lower=No improvement in physical fitness examination
Equal= No change in activities

1.1.6 Nutritional status

The outcome of nutritional status in students, all activities could have affected student's nutritional status were examined. Weight and height measurements of students who participated in the first time of this study were assessed for 3 times. As Table 4-20, conclude the nutritional status of all students in three periods of time. The result found that the prevalence rate of obesity students in the first time of this study was 45.0 % and slightly decreased to 47.5 % and 32.5 % in Time 2 and Time 3.

The student's nutritional status compared at three periods of time showed nutritional status progression of students. After finish obesity control program, two students could reduce their weight. When considering the weight and height, the result found that weight and height were slightly increased from Time 1 to Time 3. Moreover, 28 of 40 students had better nutritional status while 12 of 40 students did not improve in nutritional status.

Table 4-20 Description of student's nutritional status compared at three periods of time (n=40)

Nutritional status	**Time 1**		**Time 2**		**Time 3**	
	n	**%**	**n**	**%**	**n**	**%**
Normal (+1.5 S.D. - -1.5 S.D.)	0	0.0	0	0.0	2	5.0
At risk of overweight (+1.5 S.D. - +2 S.D.)	5	12.5	8	20.0	6	15.0
Overweight (+2 S.D. - +3 S.D.)	17	42.5	13	32.5	19	47.5
Obesity (> + 3 S.D.)	18	45.0	19	47.5	13	32.5
Better	Grade 1 =12 ; Grade 2 =7; Grade 3 =9; Total = 28					
Get worse	Grade 1 = 2 ; Grade 2 =5; Grade 3 =5; Total = 12					
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Weight	42.3	10.3	42.9	10.2	43.1	11.3
			$\overline{X}$ ± SD; 43.1±10.5			
Height	131.4	8.6	132.2	8.8	133.8	8.7
			$\overline{X}$ ± SD ; 132.4±8.7			

1.1.7 Adiposity outcome and body fat percentage

Table 4-21 Description of adiposity outcome and body fat percentage (n=40)

The adiposity outcome	Changing (n)		
	Better	**Lower**	**Equal**
Waist circumference			
Time 1 vs Time 2	18	16	6
Time 1 vs Time 3	20	15	5
$\overline{X}$ ± SD; Time 1= 80.6±9.3, Time 2=80.3±9.0, Time 3= 80.1±9.7			
Skinfold thickness			
- Triceps			
Time 1 vs Time 2	26	8	6
Time 1 vs Time 3	24	12	4
$\overline{X}$ ± SD; Time 1= 28.4±4.9, Time 2=26.0±4.8, Time 3= 26.3±5.7			
- Subscapular			
Time 1 vs Time 2	18	12	10
Time 1 vs Time 3	17	16	7
$\overline{X}$ ± SD; Time 1= 24.6±4.9, Time 2=23.7±4.5, Time 3= 24.1±4.9			
Body fat percentage			
Time 1 vs Time 2	30	10	0
Time 1 vs Time 3	27	13	0
$\overline{X}$ ± SD; Time 1= 36.4±3.1, Time 2=34.7±2.9, Time 3= 34.8±3.5			

Better =Improvement in physical fitness examination
Lower=No improvement in physical fitness examination
Equal= No change in activities

The changing of adiposity outcome and the body fat percentage was showed by compared at Time 1 vs Time 2 and Time 1 vs Time 3. The results found that all variables were better changing than the Time 1 or baseline.

Therefore, all adiposity outcomes and body fat percentages could decrease after finish obesity control program.

1.2 Control students

1.2.1 Background characteristics of the participants

Table 4-22 Characteristics of students in 3 nutritional status groups (control group) (n=44)

Characteristics	Students nutritional status							
	At risk of overweight		Overweight		Obesity		Total	
	n	%	n	%	n	%	n	%
Total	8	100.0	12	100.0	24	100.0	44	100.0
Sex								
Boy	2	25.0	5	41.7	20	83.3	27	61.4
Girl	6	75.0	7	58.3	4	16.7	17	38.6
Age (years)								
6	1	12.5	2	16.7	2	8.3	5	11.4
7	3	37.5	5	41.7	9	37.5	17	38.6
8	1	12.5	3	25.0	8	33.3	12	27.3
9	2	25.0	2	16.7	4	16.7	8	18.2
10	1	12.5	0	0.0	1	4.2	2	4.5
Mean ± SD	7.88 ± 1.35		7.42 ± 0.99		7.71 ± 0.99		7.66 ± 1.05	
Educational level								
Grade 1	2	25.0	5	41.7	5	20.8	12	27.3
Grade 2	3	37.5	4	33.3	9	37.5	16	36.4
Grade 3	3	37.5	3	25.0	10	41.7	16	36.4

The majority of control students (61.4%) were boy. For the age distribution, the overweight group was younger than overweight and at risk of overweight groups. Regarding education level, about 36.4% of subjects had attained grade 2 and 3.

1.2.2 Perception of their obesity

Table 4-23 Description of respondent's health perception of their obesity in 3 nutritional status groups (control group) (n=44)

Respondent's health perception of their obesity	Students nutritional status							
	At risk of overweight		Overweight		Obesity		Total	
	n	%	n	%	n	%	n	%
Time 1								
Total	8	100.0	12	100.0	24	100.0	44	100.0
Poor level	0	0.0	0	0.0	1	4.2	1	2.3
Moderate level	5	62.5	7	58.3	11	45.8	23	52.3
Good level	3	37.5	5	41.7	12	50.0	20	45.5
Mean ± SD	13.25 ± 1.98		12.41 ± 2.02		13.28 ± 2.21		13.02 ± 2.10	
Time 2								
Total	6	100.0	12	100.0	26	100.0	44	100.0
Poor level	0	0.0	2	16.7	0	0.0	2	4.5
Moderate level	2	33.3	7	58.3	19	73.1	28	63.6
Good level	4	66.7	3	25.0	7	26.9	14	31.8
Mean ± SD	14.66 ± 1.63		12.33 ± 2.14		13.04 ± 1.66		13.07 ± 1.91	
Time 3								
Total	6	100.0	13	100.0	25	100.0	44	100.0
Poor level	0	0.0	2	15.4	0	0.0	2	4.5
Moderate level	3	50.0	7	53.8	20	80.0	30	68.2
Good level	3	50.0	4	30.8	5	20.0	12	27.3
Mean ± SD	13.16 ± 1.83		12.15 ± 2.11		12.86 ± 1.55		12.68 ± 1.78	

As shown in table 4-23, most of the subjects had respondent's health perception of their obesity in moderate level. About 52.3%, 63.6%, and 68.2% in Time 1, 2, and 3 of three student groups had respondent's health perception of their obesity in moderate level. When considered in 3 times of collected data found that mean of respondent's health perception of their obesity in Time 3 less than Time 2, by score in Time 2 was more than Time 1 (12.68 ± 1.78, 13.07 ± 1.91, 13.02 ± 2.10, respectively).

1.2.3 Consumption behavior

1.2.3.1 Frequency of meal consumption

According to Table 4-24, the overview of meal consumption, the frequency of meal consumption indicated that most students consumed every meal in holiday. In study day, students would consume every meal in everyday (except the snack after dinner).

Table 4-24 Description of the frequency of meal consumption of their obesity in 3 nutritional status groups (control group) (n=44)

Meal/ Time	Consumption behavior					
	Study day (n=44)			Holiday (n=44)		
	Every day	Some day	None	Every day	Some day	None
Breakfast						
Time 1	34(77.3)	6(13.6)	4(9.1)	34(77.3)	6(13.6)	4(9.1)
Time 2	25(56.8)	19(43.2)	0(0.0)	31(70.5)	10(22.7)	3(6.8)
Time 3	31(70.5)	11(25.0)	2(4.5)	29(65.9)	11(25.0)	4(9.1)
Lunch						
Time 1	35(79.5)	7(15.9)	2(4.5)	31(70.5)	10(22.7)	3(6.8)
Time 2	35(79.5)	9(20.5)	0(0.0)	33(75.0)	8(18.2)	3(6.8)
Time 3	35(79.5)	7(15.9)	2(4.5)	29(65.9)	10(22.7)	5(11.4)
Dinner						
Time 1	36(81.9)	6(13.6)	2(4.5)	35(79.5)	8(18.2)	1(2.3)
Time 2	31(70.5)	11(25.0)	2(4.5)	32(72.7)	11(25.0)	1(2.3)
Time 3	34(77.3)	8(18.2)	2(4.5)	34(77.3)	7(15.9)	3(6.8)
Snack before breakfast						
Time 1	25(56.8)	15(34.1)	4(9.1)	23(52.3)	13(29.5)	8(18.2)
Time 2	14(31.8)	16(36.4)	14(31.8)	22(50.0)	7(15.9)	15(34.1)
Time 3	15(34.1)	12(27.3)	17(38.6)	21(47.7)	9(20.5)	14(31.8)

Table 4-24 Description of the frequency of meal consumption of their obesity in 3 nutritional status groups (control group) (n=44) (cont.)

Meal/ Time	Consumption behavior					
	Study day (n=44)			Holiday (n=44)		
	Every day	Some day	None	Every day	Some day	None
Snack mid morning						
Time 1	26(59.1)	10(22.7)	8(18.2)	22(50.0)	17(38.6)	5(11.4)
Time 2	19(43.2)	21(47.7)	4(9.1)	21(47.7)	16(36.4)	7(15.9)
Time 3	20(45.5)	11(25.0)	13(29.5)	20(45.5)	14(31.8)	10(22.7)
Snack mid afternoon						
Time 1	25(56.8)	10(22.7)	9(20.5)	22(50.0)	15(34.1)	7(15.9)
Time 2	15(34.1)	22(50.0)	7(15.9)	23(52.3)	13(29.5)	8(18.2)
Time 3	18(40.9)	16(36.4)	10(22.7)	18(40.9)	19(43.2)	7(15.9)
Snack after dinner						
Time 1	20(45.5)	8(18.2)	16(36.4)	21(47.7)	12(27.3)	11(25.0)
Time 2	10(22.7)	15(34.1)	19(43.2)	10(22.7)	16(36.4)	18(40.9)
Time 3	17(38.6)	10(22.7)	17(38.6)	19(43.2)	12(27.3)	13(29.5)

1.2.3.2 Type and frequency of snack or food between meal consumption per week

Table 4-25 Description of type and frequency of snack or food between meal consumption per week of 3 nutritional status groups (control group) (n=44)

Type of snack/ food	Frequency of consumption (n=44)				
	None	Every day	Always (4-6 times/wk.)	Some times (1-3 times/wk.)	Hardly (2-3 times/mo.)
Thai dessert					
Time 1	18(40.9)	4(9.1)	1(2.3)	10(22.7)	11(25.0)
Time 2	17(38.6)	5(11.4)	1(2.3)	11(25.0)	10(22.7)
Time 3	13(29.5)	4(9.1)	5(11.4)	9(20.5)	13(29.5)
Bakery					
Time 1	8(18.2)	11(25.0)	9(20.5)	9(20.5)	7(15.9)
Time 2	18(40.9)	7(15.9)	4(9.1)	10(22.7)	5(11.4)
Time 3	11(25.0)	9(20.5)	8(18.2)	8(18.2)	8(18.2)
Snack					
Time 1	8(18.2)	18(40.9)	7(15.9)	8(18.2)	3(6.8)
Time 2	12(27.3)	12(27.3)	5(11.4)	13(29.5)	2(4.5)
Time 3	10(22.7)	13(29.5)	6(13.6)	12(27.3)	3(6.8)
Candy and chocolate					
Time 1	15(34.1)	5(11.4)	1(2.3)	7(15.9)	16(36.4)
Time 2	16(36.4)	3(6.8)	8(18.2)	8(18.2)	9(20.5)
Time 3	13(29.5)	4(9.1)	9(20.5)	10(22.7)	8(18.2)
Fast food					
Time 1	8(18.2)	10(22.7)	13(29.5)	9(20.5)	4(9.1)
Time 2	11(25.0)	9(20.5)	7(15.9)	12(27.3)	5(11.4)
Time 3	8(18.2)	13(29.5)	6(13.6)	8(18.2)	9(20.5)

Table 4-25 Description of type and frequency of snack or food between meal consumption per week of 3 nutritional status groups (control group) (n=44) (cont.)

Type of snack/ food	Frequency of consumption (n=44)				
	None	Every day	Always (4-6 times/wk.)	Some times (1-3 times/wk.)	Hardly (2-3 times/mo.)
Soft drink					
Time 1	9(20.5)	7(15.9)	12(27.3)	10(22.7)	6(13.6)
Time 2	10(22.7)	9(20.5)	3(6.8)	16(36.4)	6(13.6)
Time 3	13(29.5)	6(13.6)	7(15.9)	14(31.8)	4(9.1)
Fruits juice					
Time 1	3(6.8)	24(54.5)	11(25.0)	2(4.5)	4(9.1)
Time 2	9(6.8)	22(32.8)	3(11.5)	7(53.8)	3(27.3)
Time 3	3(6.8)	21(47.7)	12(27.3)	4(9.1)	4(9.1)
Fruits					
Time 1	4(9.1)	25(56.8)	11(25.0)	1(2.3)	3(6.8)
Time 2	4(9.1)	25(56.8)	7(15.9)	5(11.4)	3(6.8)
Time 3	4(9.1)	26(59.1)	8(18.2)	4(9.1)	2(4.5)

As Table 4-25, the overview of type and frequency of snack or food between meal consumption per week, most students consumed snack, fast food, fruits juice, and fruits in everyday. Students sometimes consumed soft drink.

1.2.3.3 Type and frequency of snack or food between meal consumption per week

Table 4-26 Description of the healthy and unhealthy food frequency per week of 3 nutritional status groups (control group) (n=44)

Time	Frequency of consumption*	
	Healthy food [a]	**Unhealthy food** [b]
Time 1	76 (57.6%)	93 (42.3%)
Time 2	63 (47.7%)	67 (30.5%)
Time 3	76 (57.6%)	81 (36.8%)

* Frequency of consumption especially consumed every day and always (4-6 times/wk.)

[a] Healthy food: Thai dessert, Fruits juice, and Fruits

[b] Unhealthy food: Bakery, Snack, Candy and chocolate, fast food, and Soft drink

When considering especially the frequency of healthy and unhealthy food, the Table 4-26 presented the healthy and unhealthy food frequency per week of 3 nutritional status groups. The results showed that frequency of healthy food consumption in every day or always (4-6 times/wk.) was decreased from Time 1 and Time 2, but it increased at Time 2 and Time 3, while the frequency of unhealthy food consumption was decreased in Time 1 and Time 2, but it increased at Time 3.

Table 4-27 showed the calories of dietary intake per day of students. The mean of the calories of dietary intake per day at 3 times showed that it decreased from Time 1 to Time 2, but it increased at Time 3 in all groups of nutritional status student.

1.2.3.4 Food frequency questionnaire for children in school (24 hour recall)

Table 4-27 Description of the calories of dietary intake per day of 3 nutritional status groups (control group) (n=44)

Students nutritional status	Calories of dietary intake per day (Kcal)			Total	$\overline{X}$ ± SD
	500-1000	1001-1500	1501-2000		
At risk of overweight					
Time 1	1(12.5)	1(12.5)	6(75.0)	8(100.0)	1514.3±250.3
Time 2	1(16.7)	5(83.3)	0(0.0)	6(100.0)	1099.8±182.1
Time 3	2(33.3)	4(66.7)	0(0.0)	6(100.0)	1236.2±249.3
Overweight					
Time 1	1(8.3)	9(75.0)	2(16.7)	12(100.0)	1288.4±315.3
Time 2	1(7.7)	11(84.6)	1(7.7)	13(100.0)	1192.5±216.5
Time 3	1 (8.3)	7(58.3)	4(33.3)	12(100.0)	1347.0±364.9
Obesity					
Time 1	1(4.2)	10(41.7)	13(54.2)	24(100.0)	1507.4±282.2
Time 2	2(8.0)	22(88.0)	1(4.0)	25(100.0)	1203.4±163.8
Time 3	1(3.8)	16(61.5)	9(34.6)	26(100.0)	1347.8±225.5

1.2.3.4 Carbohydrate, protein, and fat of dietary intake per day

The nutrients from dietary intake per day that were carbohydrate, protein, and fat were calculated for comparing in 3 Times as Table 4-28. In at risk of overweight group found that carbohydrate and fat intake per day decreased from Time 1 to Time 2, and it increased at Time 3. While protein intake per day increased from Time 1 to Time 3. For overweight and obesity group found that all nutrients intake per day increased from Time 1 to Time 2, and it decreased at Time 3.

Table 4-28 Description of carbohydrate (CHO), fat (FAT), and protein (PRO) from dietary intake per day of 3 nutritional status groups (control group) (n=44)

Students nutritional status	Nutrients from dietary intake per day (g.)		
	CHO	FAT	PRO
At risk of overweight			
Time 1	96.4 ± 49.7	31.3 ± 14.8	35.2 ± 13.5
Time 2	77.4 ± 41.6	25.2 ± 10.5	39.7 ± 23.1
Time 3	136.7 ± 30.4	38.0 ± 12.1	45.9 ± 24.9
Overweight			
Time 1	98.9 ± 52.8	27.8 ± 19.5	27.7 ± 14.0
Time 2	139.9 ± 80.7	46.5 ± 24.6	48.0 ± 21.9
Time 3	122.9 ± 73.1	36.5 ± 30.9	43.7 ± 35.3
Obesity			
Time 1	85.7 ± 33.5	26.6 ± 16.4	33.2 ± 21.2
Time 2	137.4 ± 59.4	39.9 ± 18.9	47.4 ± 25.9
Time 3	98.6 ± 43.5	31.9 ± 17.9	34.4 ± 13.2

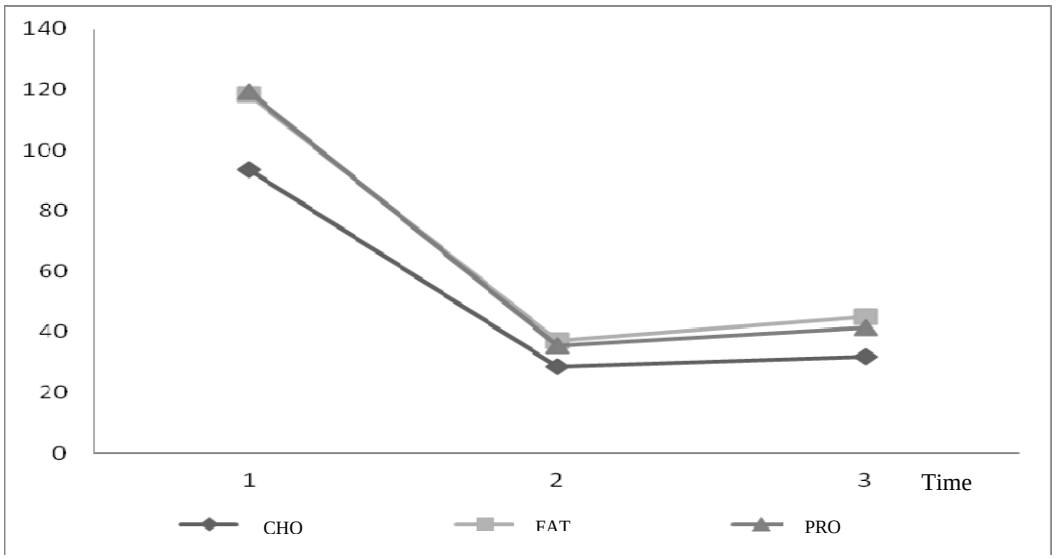

Figure 4-7: Comparison the nutrients between Thai RDI criteria and nutrients from dietary intake per day of control group

The Figure 4-7 showed the comparison of nutrients between Thai RDI criteria and nutrients from dietary intake per day of students. It found that carbohydrate intake per day of students was lower than Thai RDI (210 grams) all the Time; however, fat and protein intake per day was higher than Thai RDI criteria in Time 1. Then, it was similar with Thai RDI criteria (Fat = 45 grams, Pro = 35 grams) at Time 2 and Time 3.

1.2.4 Physical activities and exercise behavior

The energy expenditure of physical activity and exercise per day of students were showed in Table 4-29. The mean of the energy expenditure per day at 3 times was found that energy expenditure per day of all groups was increased from Time 1 to Time 2. Then, it decreased at Time 3.

Table 4-29 Description of energy expenditure per day of 3 nutritional status groups (control group) (n=44)

Students nutritional status	**Energy expenditure per day (Kcal)**			**Total**	$\overline{X}$ **± SD**
	500-1000	**1001-1500**	**1501-2000**		
At risk of overweight					
Time 1	1(12.5)	6(75.0)	1(12.5)	8(100.0)	1235.4±236.4
Time 2	1(16.7)	4(66.7)	1(16.7)	6(100.0)	1274.2±228.8
Time 3	0(0.0)	5(83.3)	1(16.7)	6(100.0)	1255.1±220.5
Overweight					
Time 1	1(8.3)	10(83.3)	1(8.3)	12(100.0)	1291.6±223.8
Time 2	1(8.3)	10(83.3)	1(8.3)	12(100.0)	1332.7±203.0
Time 3	0(0.0)	12(92.3)	1(7.7)	13(100.0)	1325.2±178.3
Obesity					
Time 1	1(4.2)	9(37.5)	14(58.3)	24(100.0)	1512.8±250.1
Time 2	0(0.0)	12(46.2)	14(53.8)	26(100.0)	1518.0±232.9
Time 3	0(0.0)	11(44.0)	14(56.0)	25(100.0)	1495.1±237.6

1.2.5 Physical fitness

The physical fitness examination between Time 1 vs Time 2 and Time 1 vs Time 3 found that students was better in push-ups 30 seconds, sit-ups 60 seconds, and zig-zag run. Two activities were lower changing these were sit and reach and standing broad jump.

Table 4-30 Description of physical fitness examination of 3 nutritional status groups (control group) (n=44)

Type of physical fitness	Changing (n)		
	Better	**Lower**	**Equal**
Push-ups 30 seconds (Times)			
Time 1 vs Time 2	24	5	15
Time 1 vs Time 3	35	1	8
$\overline{X}$ ± SD; Time 1= 7.7±5.5, Time 2=9.9±7.4, Time 3= 11.7±6.9			
Sit-ups 60 seconds (Times)			
Time 1 vs Time 2	28	7	9
Time 1 vs Time 3	34	5	5
$\overline{X}$ ± SD; Time 1= 2.9±3.6, Time 2= 5.7±6.1, Time 3= 6.9±4.6			
Sit and reach (Centimeters)			
Time 1 vs Time 2	18	21	5
Time 1 vs Time 3	14	29	1
$\overline{X}$ ± SD; Time 1 = 0.8±5.2, Time 2 = 0.1±5.7, Time 3 = -0.7±5.9			
Standing broad jump (Centimeters)			
Time 1 vs Time 2	16	23	5
Time 1 vs Time 3	19	19	6
$\overline{X}$ ± SD; Time 1= 84.1±20.0, Time 2= 83.2±19.5, Time 3= 85.9±20.1			
Zig-Zag Run (Seconds)			
Time 1 vs Time 2	27	16	1
Time 1 vs Time 3	23	19	2
$\overline{X}$ ± SD; Time 1=24.7±2.5, Time 2= 24.5±2.6, Time 3= 24.5±2.4			

Better =Improvement in physical fitness examination
Equal= No change in activities
Lower=No improvement in physical fitness examination

1.2.6 Nutritional status

The outcome of nutritional status in control students who was not receives the obesity control program. However, weight and height measurements were assessed for 3 times. As Table 4-31, conclude nutritional status of all students in three periods of time. The result found that the prevalence rate of obesity students in the first time of this study was 54.5 % and slightly increased to 59.1 % in Time 2 and decreased to 56.9 % in Time 3. Moreover, the result found that the prevalence rate of overweight students in Time 1 and Time 2 of the study was 27.3 % and slightly increased to 29.5 % in Time 3.

Table 4-31 Description of student's nutritional status compared at three periods of time (control group) (n=44)

Nutritional status	**Time 1**		**Time 2**		**Time 3**	
	n	**%**	**n**	**%**	**n**	**%**
Normal (+1.5 S.D. - -1.5 S.D.)	0	0.0	0	0.0	0	0.0
At risk of overweight (+1.5 S.D. - +2 S.D.)	8	18.2	6	13.6	6	13.6
Overweight (+2 S.D. - +3 S.D.)	12	27.3	12	27.3	13	29.5
Obesity (> + 3 S.D.)	24	54.5	26	59.1	25	56.9
Better	Grade 1 =6 ; Grade 2 =7; Grade 3 =7; Total = 20					
Get worse	Grade 1 = 6 ; Grade 2 =9; Grade 3 =9; Total = 24					
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Weight	44.4	7.7	45.8	8.2	46.5	8.3
	$\overline{X}$ ± SD; 45.6±8.1					
Height	133.1	6.5	134.7	6.6	135.6	6.9
	$\overline{X}$ ± SD; 134.5±6.7					

When considering the weight and height, the result found that weight and height were slightly increased from Time 1 to Time 3. Moreover, 20 of 40 students had better nutritional status while 24 of 40 students did not improve in nutritional status.

1.2.7 The adiposity outcome and the body fat percentage

Table 4-32 Description of adiposity outcome and body fat percentage (control group) (n=44)

The adiposity outcome	Changing (n)		
	Better	**Lower**	**Equal**
Waist circumference			
Time 1 vs Time 2	19	22	3
Time 1 vs Time 3	17	24	3
$\overline{X}$ ± SD; Time 1= 81.6±7.9, Time 2=81.6±7.7, Time 3= 81.5±7.8			
Skinfold thickness			
- Triceps			
Time 1 vs Time 2	12	25	7
Time 1 vs Time 3	13	25	6
$\overline{X}$ ± SD; Time 1= 29.0±5.0, Time 2=30.2±5.2, Time 3= 29.4±4.8			
- Subscapular			
Time 1 vs Time 2	22	20	2
Time 1 vs Time 3	14	24	6
$\overline{X}$ ± SD; Time 1= 26.5±5.8, Time 2=26.8±5.2, Time 3= 27.3±5.2			
Body fat percentage			
Time 1 vs Time 2	17	26	1
Time 1 vs Time 3	18	26	0
$\overline{X}$ ± SD; Time 1= 36.**7**±2.8, Time 2=37.3±2.7, Time 3= 36.8±2.5			

Better =Improvement in physical fitness examination
Equal= No change in activities
Lower=No improvement in physical fitness examination

The description of adiposity outcome and body fat percentage was showed as Table 4-32. The changing of adiposity outcome and body fat percentage was showed by compared at Time 1 vs Time 2 and Time 1 vs Time 3. The results found that most variables were lower changing than baseline. However, skinfold thickness at subscapular from Time 2 was better changing than Time 1 or baseline.

1.3 The comparison between experimental and control group

Part 1: General Characteristics of the Subjects

As Table 4-33 showed the main characteristic. The results found that were not statistical differences regarding gender (p-value=0.730), age (p-value=0.240) and nutritional status (p-value=0.329) of students in both group. In addition, the number of obese group students was higher than overweight and at risk of overweight students.

Table 4-33 Description of characteristic of experimental and control group (n=84)

Characteristic	Experimental group		Control group	
	n	%	n	%
Total	40	100.0	44	100.0
Gender				
Boy	26	65.0	27	61.4
Girl	14	35.0	17	38.6
χ^2 =0.12 df=1	p-value=0.730 [a]			
Age (years)				
6	4	10.0	5	11.4
7	12	30.0	17	38.6
8	11	27.5	12	27.3
9	8	20.0	8	18.2
10	5	12.5	2	4.5
$\overline{X}$ ± SD;	7.95±1.19		7.66±1.05	
t =1.184 df=82	p-value=0.240 [b]			
Nutritional status				
At risk of overweight	5	12.5	8	18.2
Overweight	17	42.5	12	27.3
Obese	18	45.0	24	54.5
χ^2=2.226 df=2	p-value=0.329 [a]			

[a] = Pearson's chi-square test

[b] = Paired t-test

Part 2: The comparison the effect of obesity control program

After implementation in obesity control program, the nutritional status between experimental and control group revealed that experimental students had been improved in nutritional status about 28 of 40 students (70.0%) and 20 of 44 control students (45.45%). When considering the students who had worse nutritional status found that 12 of 40 experimental students (30.0 %) and 24 of 44 control students (54.54%). Moreover, two-way repeated measures ANOVA method was used for comparison the effect of obesity control program. The outcome and output testing included 1) the respondent's health perception of their obesity, 2) the body fat percentage, 3) the calories of dietary intake per day, and 4) the energy expenditure per day.

1. Respondent's health perception of their obesity

The Table 4-34 showed the means scores of respondent's health perception at three periods of time in experimental and control group. Most students had moderate level (score 10-13) of respondent's health perception of their obesity. For experimental group, found the average of respondent's health perception of their obesity score in Time 1 and Time 2 was increased from 12.4±2.5 to 13.3±2.2, respectively. Then it slightly decreased to 13.2±2.4 in Time 3. For control group, the average of respondent's health perception of their obesity score was increased from Time 1 (13.0 ±2.1) to Time 2 (13.1±1.9), but it dropped at Time 3 (12.6±1.6).

Table 4-34 The average means scores of respondent's health perception at three periods of time in experimental and control group

Respondent's health perception score	**Experimental group (n=40)**	**Control group (n=44)**
	$\overline{X}$ (SD)	$\overline{X}$ (SD)
Before program intervention (Time1)	12.4 (2.5)	13.0 (2.1)
During program intervention (Time2)	13.3 (2.2)	13.1 (1.9)
Immediately after program intervention (Time 3)	13.2 (2.4)	12.6 (1.6)

The Table 4-35 showed the mean score of respondent's health perception, the mean scores of experimental and control group were not significantly different from each other (p-value=0.79). The overall within group factors indicated that had no any pair of respondent's health perception score by time interaction was different (p-value=0.72).

Table 4-35 Comparison of respondent's health perception between group and within group

Source of variables	SS	df	Ms	F	p-value [a b]
Between groups					
Groups	0.308	1	0.308	0.067	0.79
Between groups error	372.398	81	4.598		
Within groups					
Time	2.975	2	1.488	0.322	0.725
Groups *Time	15.952	2	7.976	1.727	0.181
Within groups error	748.127	162	4.618		

[a] p-value <0.05
[b] Sphericity Assumed

2. Calories of dietary intake per day

The calories of dietary intake per day of experimental and control group students represented in Table 4-36. The table showed that experimental group consumed food per day was decreased from Time 1 (1309.4±278.5) to Time 2 (1022.8±250.0), and it was decreased at Time 3 (892.8 ±252.8). During control group was decreased from Time 1 (1448.9±296.8) to Time 2 (1186.0±182.1), but it was increased at Time 3 (1332.3±268.9) as the line graph (Figure 4-8).

Table 4-36 The average means of the calories of dietary intake per day at three periods of time in experimental and control group

Calories of dietary intake per day	Experimental group (n=40)	Control group (n=44)
	$\overline{X}$ (SD)	$\overline{X}$ (SD)
Before program intervention (Time1)	1309.4 (278.5)	1448.9 (296.8)
During program intervention (Time2)	1022.8 (250.0)	1186.0 (182.1)
Immediately after program intervention (Time 3)	892.8 (252.8)	1332.3 (268.9)

Table 4-37 Comparison of the calories of dietary intake per day between group and within group

Source of variables	SS	df	Ms	F	p-value [a b]
Between groups					
Groups	3665612.53	1	366561.53	25.36	< 0.001[a]
Between groups error	1.171E7	81	144513.92		
Within groups					
Time	89739.15	1.57	44869.57	1.69	0.046 [a]
Groups *Time	1192541.78	1.57	759300.53	22.53	< 0.001[a]
Within groups error	4288186.01	127.22	33707.67		

[a] p-value <0.05
[b] Greenhouse-Gesser

Table 4-38 Comparison of the calories of dietary intake per day at three periods of time between experimental and control group

Calories of dietary intake per day	Mean difference	Std. Error	p-value [a b]
Experimental group			
Time 2 – Time 1	-286.61	39.32	<0.001 [a]
Time 3 – Time 2	-129.98	16.50	<0.001 [a]
Time 3 – Time 1	-416.60	43.49	<0.001 [a]
Control group			
Time 2 – Time 1	-262.91	40.85	<0.001 [a]
Time 3 – Time 2	146.32	29.29	<0.001 [a]
Time 3 – Time 1	-116.59	37.65	<0.001 [a]

[a] p-value <0.05
[b] Bonferroni's method

The calories of dietary intake per day of experimental and control group were significantly different (p-value <0.001). The experimental group had calories of dietary intake per day lower than the control group. The overall within group factors indicated that had some pair of the calories of dietary intake per day in time was different (p-value=0.046).The interaction between group and difference of time measurement was significantly difference (p-value<0.001), as shown in Table 4-37.

The Table 4-38 showed the comparison of the calories of dietary intake per day at three periods of time between experimental and control group. It showed that mean score of experimental and control group was first measurement before program intervention, the second measurement during program intervention, and after program intervention were significantly difference (p-value<0.001). In experimental group, the mean score of after the intervention was significantly lower than the mean score obtained from the first measurement before program intervention and the second measurement during program intervention (p-value<0.001); however, the second measurement during program intervention was still significantly lower than the mean score obtained from the first measurement before program intervention (p-value<0.001). During control group, the mean score of the first measurement before program intervention was significantly higher than the mean score obtained from the second measurement during program intervention (p-value<0.001); however, the second measurement during program intervention was still significantly lower than the mean score obtained from the after the intervention (p-value<0.001).

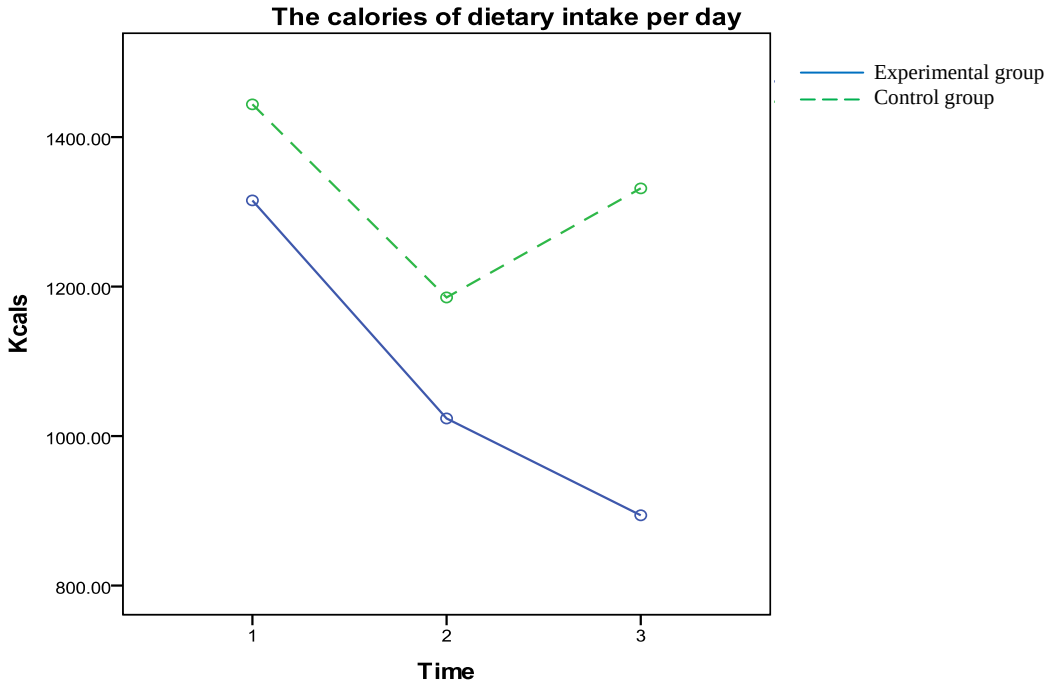

Figure 4-8: The means score of line graph of the calories of dietary intake per day in experimental and control group

3. Energy expenditure per day

The means scores of energy expenditure per day at three periods of time in experimental and control group was showed in Table 4-39. For experimental group, found the average the energy expenditure per day in Time 1 and Time 2 was increased from 1214.5±282.1 to 1276.8 ±267.8, respectively. Then it slightly increased to 1369.2±266.2 at Time 3. For control group, the average of energy expenditure per day in Time 1 and Time 2 was decreased from 1448.9±296.8 to 1434.2±242.6, respectively. Then it dropped to 1412.2±236.2 at Time 3, as the line graph presented changes at three periods in term of mean scores (Figure 4-9).

Table 4-39 The average means of energy expenditure per day at three periods of time in experimental and control group

Energy expenditure per day	Experimental group (n=40)	Control group (n=44)
	$\overline{X}$ (SD)	$\overline{X}$ (SD)
Before program intervention (Time1)	1214.5 (282.1)	1448.9 (296.8)
During program intervention (Time2)	1276.8 (267.8)	1434.2 (242.6)
Immediately after program intervention (Time 3)	1369.2 (266.2)	1412.2 (236.2)

Table 4-40 Comparison of energy expenditure per day between group and within group

Source of variables	SS	df	Ms	F	p-value [a b]
Between groups					
Groups	846499.44	1	846499.44	4.61	0.035 [a]
Between groups error	1.485E7	81	183348.60		
Within groups					
Time	74889.67	1.79	41761.66	9.19	<0.001 [a]
Groups *Time	231155.21	1.79	128901.97	28.39	<0.001 [a]
Within groups error	659489.61	145.25	4540.24		

[a] p-value <0.05
[b] Greenhouse-Gesser

The energy expenditure per day of experimental and control group were significantly different (p-value=0.035). The experimental group had energy expenditure per day lower than the control group. However, the trend of this changing could indicate that energy expenditure per day in experimental group was higher than control group. The overall within group factors indicated that had some pair of energy expenditure per day in time interaction was different, (p-value<0.001), as shown in Table 4-40.

Table 4-41 Comparison the means scores of energy expenditure per day at three periods of time between experimental and control group

Energy expenditure per day	Mean difference	Std. Error	p-value [a b]
Experimental group			
Time 2 – Time 1	62.36	11.76	<0.001 [a]
Time 3 – Time 2	92.30	15.62	<0.001 [a]
Time 3 – Time 1	154.66	17.60	<0.001 [a]
Control group			
Time 2 – Time 1	32.18	15.06	0.12
Time 3 – Time 2	-22.07	7.42	0.014 [a]
Time 3 – Time 1	10.12	14.59	1.00

[a] p-value <0.05
[b] Bonferroni's method

The comparison of energy expenditure per day at three periods of time between experimental and control group was showed in Table 4-41. It showed that mean score of experimental was first measurement before program intervention, the second measurement during program intervention, and after program intervention were significantly difference (p-value<0.001). The mean score of experimental group after intervention was significantly higher than the mean score obtained from the second measurement during program intervention and before program intervention (p-value<0.001); however, the second measurement during program intervention was still significantly higher than the mean score obtained from the first measurement before program intervention (p-value<0.001). During control group, the mean score after intervention was significantly lower than the mean score obtained from the second measurement during program intervention (p-value=0.014).

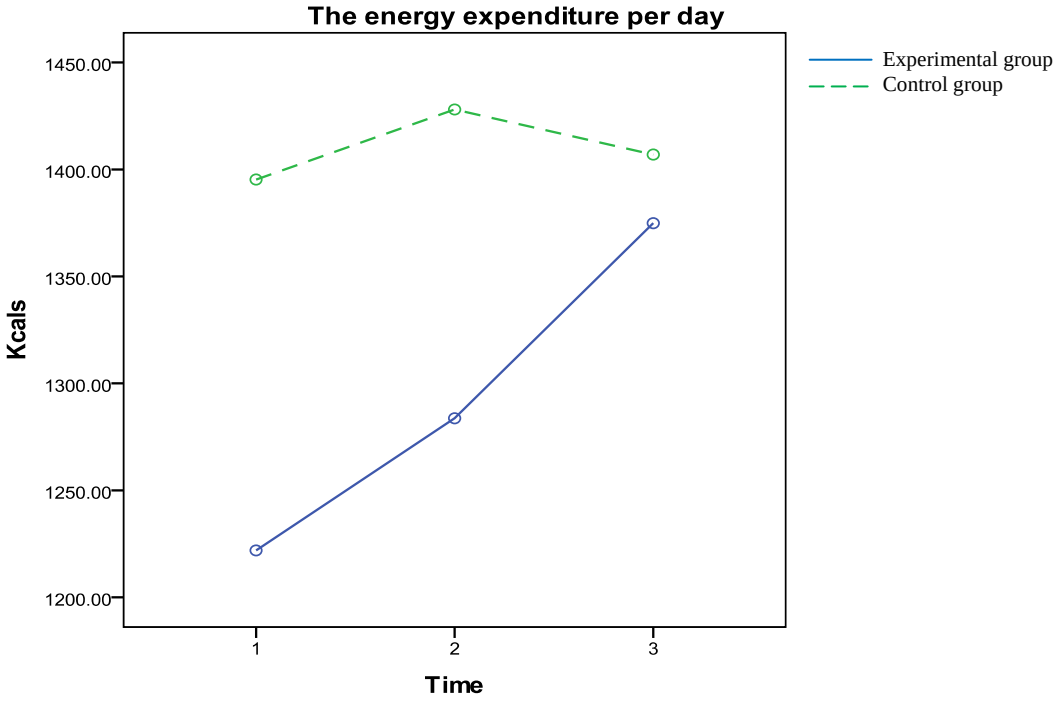

Figure 4-9: The means score of line graph of the energy expenditure per day in experimental and control group

4. The body fat percentage

The Table 4-42 showed the means of body fat percentage at three periods of time in experimental and control group. For experimental group, found the average of body fat percentage was decreased from Time 1 (36.4±3.1) to Time 2 (34.7±2.9), but it was slightly increased at Time 3 (34.8 ±3.4). During control group was increased from Time 1 (36.7±2.8) to Time 2 (37.3±2.7), but it dropped at Time 3 (36.8±2.5). The line graph presented changes at three periods in term of mean scores (Figure 4-10).

Body fat percentage of experimental and control group were significantly different (p-value=0.009). The overall within group factors indicated that had some pair of body fat percentage in time was different (p-value=0.032). The interaction between group and difference of time measurement was significantly difference (p-value<0.001), as shown in Table 4-42.

Table 4-42 The average means of body fat percentage at three periods of time in experimental and control group

Body fat percentage	**Experimental group (n=40)**	**Control group (n=44)**
	$\overline{X}$ (SD)	$\overline{X}$ (SD)
Before program intervention (Time1)	36.4 (3.1)	36.7 (2.8)
During program intervention (Time2)	34.7 (2.9)	37.3 (2.7)
Immediately after program intervention (Time 3)	34.8 (3.4)	36.8 (2.5)

Table 4-43 Comparison of body fat percentage between group and within group

Source of variables	**SS**	**df**	**Ms**	**F**	**p-value [a b]**
Between groups					
Groups	142.80	1	142.80	7.17	0.009 [a]
Between groups error	1612.73	81	19.91		
Within groups					
Time	0.52	1.61	0.37	0.12	0.032 [a]
Groups *Time	61.65	1.61	38.32	13.73	< 0.001 [a]
Within groups error	363.51	130.31	2.79		

[a] p-value <0.05

[b] Greenhouse-Gesser

The experimental group had body fat percentage lower than the control group. The mean score of experimental group after intervention were not different from the mean score obtained from the second measurement during program intervention (p-value=1.00); however, it was still significantly lower than the mean score obtained from the first measurement before program intervention (p-value=0.007). Moreover, the mean score of second measurement during program intervention was significantly lower than before program intervention (p-value=0.001). During control group, the mean score of three times measurement was not different (p-value > 0.05).

Table 4-44 Comparison of body fat percentage at three periods of time between experimental and control group

Body fat percentage	Mean difference	Std. Error	p-value [a b]
Experimental group			
Time 2 – Time 1	-1.66	0.37	0.001 [a]
Time 3 – Time 2	0.08	0.27	1.00
Time 3 – Time 1	-1.58	0.48	0.007 [a]
Control group			
Time 2 – Time 1	0.60	0.30	0.16
Time 3 – Time 2	-0.45	0.21	0.13
Time 3 – Time 1	1.16	0.29	1.00

[a] p-value <0.05
[b] Bonferroni's method

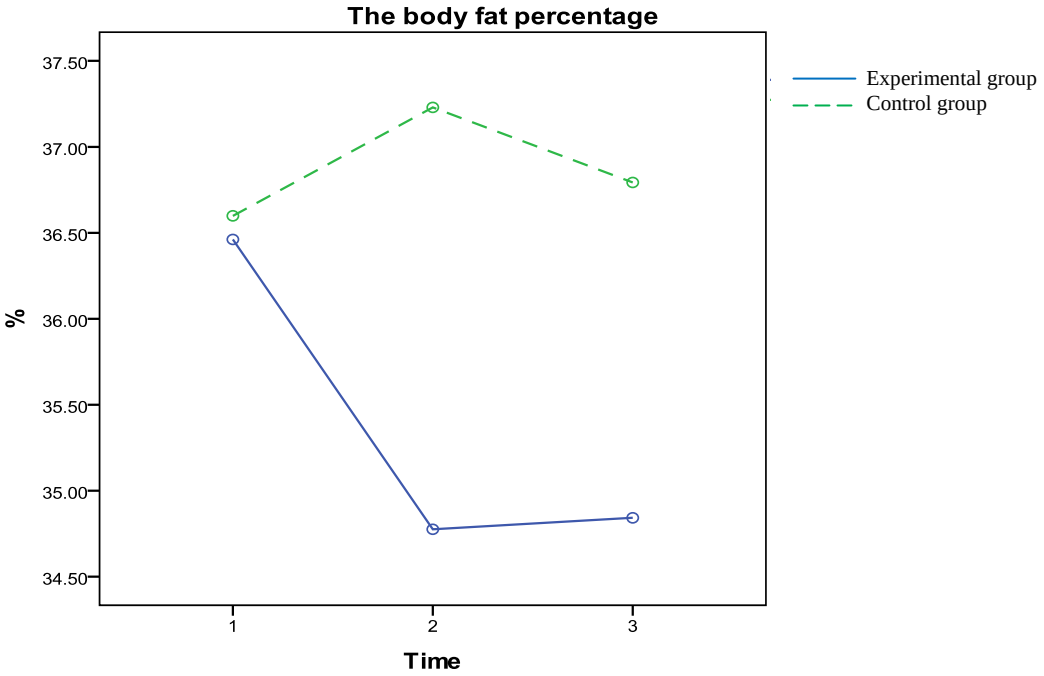

Figure 4-10: The means score of line graph of body fat percentage in experimental and control group

2. Parents

2.1 The experimental parents

2.1.1 Background characteristics of parents

Table 4-45 Characteristics of parents in 3 nutritional status groups (n=40)

Characteristics	Students nutritional status							
	At risk of overweight		Overweight		Obesity		Total	
	n	%	n	%	n	%	n	%
Total	5	100.0	17	100.0	18	100.0	40	100.0
Sex								
Male	1	20.0	7	41.2	5	27.8	13	32.5
Female	4	80.0	10	58.8	13	72.2	27	67.5
Age (years)								
< 30	1	20.0	5	29.4	6	33.3	12	30.0
31-40	2	40.0	5	29.4	5	27.7	12	30.0
41-50	2	40.0	3	17.6	3	16.8	8	20.0
>50	0	0.0	4	23.6	4	22.2	8	20.0
Mean ± SD	35.21 ± 1.24		36.43 ± 1.35		35.46 ± 1.03		35.70 ± 1.18	
Educational level								
Prathom	2	40.0	3	17.6	3	16.8	8	20.0
Mathayom	1	20.0	2	11.8	3	16.8	6	15.0
Diploma	1	20.0	5	29.4	5	27.7	11	27.5
Bachelor degree or higher	1	20.0	7	41.2	7	38.7	15	37.5
Occupation								
Housewife	2	40.0	3	17.6	4	22.2	9	22.5
Government	1	20.0	5	29.4	5	27.8	11	27.5
Private employee	1	20.0	6	35.4	5	27.8	12	30.0
Labor	1	20.0	3	17.6	4	22.2	8	20.0

Table 4-45 presented the characteristics of parents in 3 groups that followed the nutritional status of their student. The result found that the majority of subjects (67.5%) were female. For the age distribution, parents of overweight group were older than at risk of overweight and obesity groups. Regarding education level, about 37.5% of subjects had attained bachelor degree or higher. Most occupation of parents was private employee.

1.1.2 Perception of the obesity in their child

Table 4-46 Description of parent's perception of obesity in their child in 3 student groups of nutritional status (n=40)

Parent's perception of obesity in their child	**Students nutritional status**							
	At risk of overweight		**Overweight**		**Obesity**		**Total**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Time 1								
Total	5	100.0	17	100.0	18	100.0	40	100.0
Poor level	0	0.0	0	0.0	1	0.0	1	2.5
Moderate level	2	40.0	9	52.9	9	50.0	20	50.0
Good level	3	60.0	8	47.0	8	50.0	19	47.5
Mean ± SD	34.01 ± 3.23		33.45 ± 4.12		34.87 ± 5.63		34.15 ± 3.51	
Time 2								
Total	8	100.0	13	100.0	19	100.0	40	100.0
Poor level	0	0.0	1	7.7	0	0.0	1	2.5
Moderate level	4	20.0	5	38.5	10	52.6	19	47.5
Good level	4	20.0	7	53.8	9	47.4	20	50.0
Mean ± SD	35.32 ± 5.68		35.21 ± 4.88		35.54 ± 5.53		35.38 ± 5.73	
Time 3								
Total	8	100.0	19	100.0	13	100.0	40	100.0
Poor level	0	0.0	0	0.0	1	7.7	1	2.5
Moderate level	3	37.5	9	47.4	5	38.5	17	42.5
Good level	5	62.5	10	52.6	7	53.8	22	55.0
Mean ± SD	36.73 ± 6.12		36.32 ± 5.41		35.67 ± 6.08		36.19 ± 5.87	

Table 4-46 presented the parent's perception of obesity in their child that consisted of 12 dimensions, which were prior health, current health, health outlook, resistance and susceptibility to illness, health worry and concern, and sickness orientation. Mean score between 12-23 means the parent's perception of obesity in their child was at poor level, between 24-35 was moderate level, and between 36-48 was good level. Most of the subjects had parent's perception of obesity in their child in moderate level in Time 1 and 2, and good level in Time 3. When considered in 3 times of collected data found that mean of parent's perception of obesity in their child in Time 1 lesser than Time 2 and Time 2 lesser than time 3, respectively.

The repeated measure ANOVA was used to evaluate each consumption behavior of students for 3 times. However, no significant difference in score of parent's perception of obesity in their child was observed among the three times, ($F_{(2, 78)}$ =7.906; p-value =0.089) as shown in Table 4-47.

Table 4-47 Analysis of variance of parent's perception of obesity in their child at three periods of time

Source of variables	SS	df	Ms	F	p-value
Within groups	290847.434	80			
Time	49023.173	2	24511.586	7.906	0.089
Within groups error	241824.261	78	3100.311		

2.1.3 The consumption behavior

The calories of dietary intake per day of parents were showed in Table 4-48. The mean of the calories of dietary intake per day at 3 times found that mean of calories of dietary intake per day in Time 1 lesser than Time 2 and Time 2 higher than time 3, respectively. However, no significant difference in score of the calories of dietary intake per day was observed among the three times, ($F_{(2, 78)}$ =26.596; p-value =0.092) as shown in Table 4-49.

Table 4-48 Description of the calories of dietary intake per day of parents in 3 student groups of nutritional status (n=40)

Students nutritional status	Calories of dietary intake per day (Kcal)			Total	$\overline{X}$ ±SD
	1001-1500	1501-2000	>2001		
At risk of overweight					
Time 1	0(0.0)	2(40.0)	3(60.0)	5(100.0)	2546.2±238.6
Time 2	2(25.0)	1(12.5)	5(62.5)	8(100.0)	2489.4±252.8
Time 3	2(25.0)	3(37.5)	3(37.5)	8(100.0)	2342.3±266.1
Total	4(19.0)	6(28.6)	11(52.4)	21(100.0)	2448.7±259.2
Overweight					
Time 1	3(17.6)	5(29.5)	9(52.9)	17(100.0)	2559.1±225.1
Time 2	2(15.4)	3(23.1)	8(61.5)	13(100.0)	2398.6±242.5
Time 3	3(15.8)	9(47.4)	7(36.8)	19(100.0)	2403.9±231.7
Total	8(16.3)	17(34.7)	24(49.0)	49(100.0)	2473.8±276.3
Obesity					
Time 1	4(22.2)	8(44.4)	6(33.4)	18(100.0)	1890.7±353.9
Time 2	4(21.1)	5(26.3)	10(52.6)	19(100.0)	2498.5±273.8
Time 3	2(15.4)	2(15.4)	9(69.2)	13(100.0)	2387.4±266.0
Total	10(20.0)	15(30.0)	25(50.0)	50(100.0)	2306.7±257.5

Table 4-49 Analysis of variance of the calories of dietary intake per day at three periods of time in parents

Source of variables	SS	df	Ms	F	p-value
Within groups	945430.432	80			
Time	383331.713	2	191665.856	26.596	0.092
Within groups error	562098.719	78	7206.393		

2.1.4 The physical activities and exercise behavior

For the physical activities and exercise behavior of parents, the mean of the energy expenditure per day at 3 times in Time 1 lesser than Time 2 and Time 2 higher than time 3, respectively. However, no significant difference in score of the energy expenditure per day at 3 times observed among the three times, ($F_{(2, 78)}$ =42.858; p-value =0.542) as shown in Table 4-50 and Table 4-51.

Table 4-50 The average means scores of the energy expenditure per day at three periods of time in parents

Time	**Mean ± S.D.**
Before program intervention (Time1)	1818.78 ± 279.98
During program intervention (Time2)	2100.44 ± 249.02
Immediately after program intervention (Time 3)	2065.19 ± 286.32
F=42.858, df =2,78 , p = 0.542	

Table 4-51 Analysis of variance of the energy expenditure per day at three periods of time in parents

Source of variables	**SS**	**df**	**Ms**	**F**	**p-value**
Within groups	743703.332	80			
Time	389381.124	2	194690.562	42.858	0.542
Within groups error	354322.208	78	4542.592		

2.2 The control group

2.2.1 Background characteristics of parents

Table 4-52 The characteristics of parents in 3 groups of nutritional status (control group) (n=44)

Characteristics	Students nutritional status							
	At risk of overweight		Overweight		Obesity		Total	
	n	%	n	%	n	%	n	%
Total	8	100.0	12	100.0	24	100.0	44	100.0
Sex								
Male	3	37.5	4	33.3	10	41.7	17	38.6
Female	5	62.5	8	66.7	14	58.3	27	61.4
Age (years)								
< 30	3	37.5	3	25.0	6	25.0	12	27.3
31-40	2	25.0	2	16.7	7	29.2	11	25.0
41-50	2	25.0	4	33.3	8	33.3	14	31.8
>50	1	12.5	3	25.0	3	12.5	7	15.9
Mean ± SD	31.45 ± 1.26		35.33 ± 1.25		34.45 ± 1.13		33.74 ± 1.21	
Educational level								
Prathom	2	25.0	2	16.7	5	20.8	9	20.5
Mathayom	3	37.5	3	25.0	5	20.8	11	25.0
Diploma	1	12.5	3	25.0	5	20.8	9	20.5
Bachelor degree or higher	2	25.0	4	33.3	9	37.6	15	34.0
Occupation								
Housewife	3	37.5	4	33.3	4	16.7	11	25.0
Government	2	25.0	5	41.7	7	29.2	14	31.8
Private employee	2	25.0	2	16.7	8	33.3	12	27.3
Labor	1	12.5	1	8.3	5	20.8	7	15.9

Table 4-52 presented the characteristics of parents in 3 groups that followed the nutritional status of their student. The result found that the majority of subjects (61.4%) were female. For the age distribution, the parents of overweight group were older than at risk of overweight and obesity groups. Regarding education level, about 34.0% of subjects had attained bachelor degree or higher. Most occupation of parents was government.

For the parent's perception of obesity in their child**,** most of the subjects had parent's perception of obesity in their child in moderate level in Time 1 to Time 3. When considered in 3 times of collected data found that mean of parent's perception of obesity in their child in Time 1 higher than Time 2 and Time 2 lesser than time 3, respectively as shown in Table 4-53. However, no significant difference in score of parent's perception of obesity in their child was observed among the three times, ($F_{(2, 86)}$ =11.319; p-value =0.059) as shown in Table 4-54.

2.2.2 Perception of the obesity in their child

Table 4-53 The average means scores of parent's perception of obesity in their child at three periods of time (control group)

Time	**Mean ± S.D.**
Before program intervention (Time1)	35.26 ± 3.23
During program intervention (Time2)	34.25 ± 3.25
Immediately after program intervention (Time 3)	35.56 ± 3.87
F=11.319, df=2,86 , p=0.059	

Table 4-54 Analysis of variance of parent's perception of obesity in their child at three periods of time (control group)

Source of variables	**SS**	**df**	**Ms**	**F**	**p-value**
Within groups	278475.453	88			
Time	58029.193	2	29014.596	11.319	0.059
Within groups error	220446.260	86	2563.32		

2.2.3 The consumption behavior

The calories of dietary intake per day of parents were showed the mean of the calories of dietary intake per day at 3 times found that mean of calories of dietary intake per day in Time 1 lesser than Time 2 and Time 3, respectively (Table 4-54). However, no significant difference in score of the calories of dietary intake per day was observed among the three times, ($F_{(2, 78)}$ =13.381; p-value =0.089) as shown in Table 4-56.

Table 4-55 The average means scores of the calories of dietary intake per day at three periods of time in parents (control group)

Time	**Mean ± S.D.**
Before program intervention (Time1)	2434.8 ± 261.9
During program intervention (Time2)	2458.6 ± 254.0
Immediately after program intervention (Time 3)	2579.4 ± 253.1
F=43.252, df=2,86 , p = 0.124	

Table 4-56 Analysis of variance of the calories of dietary intake per day at three periods of time in parents (control group)

Source of variables	**SS**	**df**	**Ms**	**F**	**p-value**
Within groups	835680.245	88			
Time	419061.342	2	209530.671	43.252	0.124
Within groups error	416618.903	86	4844.405		

2.2.4 The physical activities and exercise behavior

For the physical activities and exercise behavior of parents, the mean of the energy expenditure per day at 3 times in Time 1 lesser than Time 2 and Time 2 higher than time 3, respectively (Table 4-57). However, no significant difference in score of the energy expenditure per day at 3 times observed among the three times, ($F_{(2, 86)}$ =33.633; p-value =0.423) as shown in Table 4-58.

Table 4-57 The average means scores of the energy expenditure per day at three periods of time in parents (control group)

Time	**Mean ± S.D.**
Before program intervention (Time1)	1985.65 ± 286.32
During program intervention (Time2)	2200.76 ± 231.38
Immediately after program intervention (Time 3)	2098.94 ± 254.77
F=33.633, df =2,86 , p = 0.423	

Table 4-58 Analysis of variance of the energy expenditure per day at three periods of time in parents (control group)

Source of variables	**SS**	**df**	**Ms**	**F**	**p-value**
Within groups	737021.321	88			
Time	323468.421	2	161734.211	33.633	0.423
Within groups error	413552.900	86	4808.755		

The results of this study, it could conclude in Table 4-59 as follows:

Table 4-59 Conclusion the results from this study for student group

Variables	Groups	The times of measurement			Different pairs within groups
		First measurement before program intervention	Second measurement during program intervention	Immediately after program intervention	
		$\overline{X}$ (SD)	$\overline{X}$ (SD)	$\overline{X}$ (SD)	
Children's perception of their obesity	**Experiment**	12.4(2.5)	13.3(2.2)	13.2(2.4)	NS
	Control	13.0(2.1)	13.1(1.9)	12.6(1.6)	NS
	$F^{b}_{(1, 81)} = 0.067$, $F^{w}_{(2)} = 0.32$, $F^{i}_{(2)} = 1.72$				
Calories of dietary intake per day	**Experiment**	1309.4(278.5)	1022.8(250.0)	892.8(252.8)	1vs2, 1vs3, 2vs3
	Control	1448.9(296.8)	1186.0(182.1)	1332.3(268.9)	1vs2, 1vs3, 2vs3
	$F^{b}_{(1, 81)} = 25.36^{*}$, $F^{w}_{(1.57)} = 1.69^{*}$, $F^{i}_{(1.57)} = 22.53^{*}$				

Table 4-59 Conclusion the results from this study for student group (cont.)

Variables	Groups	The times of measurement			Different pairs within groups
		First measurement before program intervention	Second measurement during program intervention	Immediately after program intervention	
		$\overline{X}$ (SD)	$\overline{X}$ (SD)	$\overline{X}$ (SD)	
Energy expenditure per day	**Experiment**	1214.5(282.1)	1276.8(267.8)	1369.2(266.2)	1vs2, 1vs3, 2vs3
	Control	1448.9(296.8)	1434.2(242.6)	1412.2(236.2)	2vs3
	$F^{b}_{(1, 81)} = 4.61^{*}$, $F^{w}_{(1.79)} = 9.19^{*}$, $F^{i}_{(1.79)} = 28.39^{*}$				
Body fat percentage	**Experiment**	36.4(3.1)	34.7(2.9)	34.8(3.4)	1vs2, 1vs3
	Control	36.7(2.8)	37.3(2.7)	36.8(2.5)	NS
	$F^{b}_{(1, 81)} = 0.067^{*}$, $F^{w}_{(2)} = 0.32^{*}$, $F^{i}_{(2)} = 1.72^{*}$				

Remark:

* = p-value <0.05

$F^{b}_{(df,df)}$ = Compare the differences between groups

$F^{w}_{(df)}$ = Compare the differences within groups

$F^{i}_{(df)}$ = Interactions between groups and time

1vs2 = Compare different pairs within groups between before program intervention and the second measurements during program intervention

1vs2 = Compare different pairs within groups between before program intervention and after program intervention

2vs3 = Compare different pairs within groups between the second measurements during program intervention and after program intervention

NS = Non significance

Table 4-60 Conclusion the results from this study for parent group

Variables	Groups	The times of measurement			Different pairs within groups
		First measurement before program intervention	Second measurement during program intervention	Immediately after program intervention	
		$\overline{X}$ (SD)	$\overline{X}$ (SD)	$\overline{X}$ (SD)	
Parent's perception of obesity in their child	**Experiment**	34.1(3.5)	35.3(5.7)	36.2(5.8)	NS
	Control	35.2(3.2)	34.2(3.2)	35.5(3.8)	NS
	$F^{we}_{(2,78)} = 7.90$, $F^{wc}_{(2,86)} = 11.31$				
Calories of dietary intake per day	**Experiment**	2448.7(259.2)	2473.8(276.3)	2306.7(257.5)	NS
	Control	2434.8(261.9)	2458.6(254.0)	2579.4(253.1)	NS
	$F^{we}_{(2,78)} = 26.6$, $F^{wc}_{(2,86)} = 43.25$				
Energy expenditure per day	**Experiment**	1818.8(279.9)	2100.4(249.0)	2065.2(286.3)	NS
	Control	1985.6(286.3)	2200.7(231.4)	2098.9(254.7)	NS
	$F^{we}_{(2,78)} = 42.85$, $F^{wc}_{(2,86)} = 33.63$				

Remark:

* = p-value <0.05

$F^{we}_{(df,df)}$ = Compare the differences within experimental groups

$F^{wc}_{(df,df)}$ = Compare the differences within control groups

NS = Non significance

2. The opinion after completing the obesity control program

After finish program, the researcher interviewed the participants that were students, parents, teachers, food cookers, and school directors about the results of obesity control program for considering about the collaboration and satisfaction of obesity control program. The detail of this session revealed as follows:

2.1 Collaboration

From the opinion of participants could bring the statement that presented about the collaboration in this obesity control as follows:

Student:

"I could participate with program by brainstorm for school lunch thinking." (Student 3)

Parent:

"I want to have this activity all the time. If this project was performed in short period, Children wouldn't receive the knowledge every day. They would it forget and don't have awareness of obesity. I could receive and bring the knowledge from document knowledge and newsletter to my children for knowledge connection with children at home." (Parent 5)

"I could manage the healthy food and exercise in their home." (Parent 2)

Teachers:

"I want to have this activity all the time such as integration the obesity control contents in all subjects. I would support this activity." (Teacher 5)

"The students could the obesity control knowledge to their life."(Teacher 2)

Food cooker:

"I wanted to have this activity because students could have healthy. If students don't obesity, they would have healthy." (Food cooker 1)

"I thought that the healthy food in school was the importance for students. Food cooker could responsible person for cooking the healthy food in school lunch meal." (Food cooker 1)

2.2 Satisfaction

Satisfaction was evaluated after finish the obesity control program. All participants presented the statement that presented about the satisfaction as follows:

School director:

"Nowadays, students could have the obesity control knowledge for using in their life." (School director B)

Student:

"I felt that I had weight reduction and knowledge increasing." (Student 5)

"I know that I receive the healthy food consumption knowledge, danger of sweet food, snack, carbonate drink and quantity of food per meal. These activities helped me to healthy students." (Student 1)

Parent:

"The children could bring the obesity control knowledge to family and they could teach younger sister and parent." (Parent 2)

Teachers:

"The students had awareness of the danger of obesity and the effect of fat food, snack, and carbonate drink." (Teacher 3)

"The good result from the students could receive the knowledge to their life. So, this good activity." (Teacher 7)

Food cooker:

"The children had weight reduction, normal nutritional status and healthy." (Food cooker 1)

"The children were care for food consumption. Some students ate snack decreasing." (Food cooker 2)

The problem that researcher met after student's home visit was controlling body weight as follows:

When considering the problem of students who still overweight after finish program. Three students could have the same problem of overweight as follows:

Consumption behavior:

-Students ate for 4-5 meal per day.

-Students liked snack and carbonate drinking consumption.

-The rearing of students was the obesity factor from grandparent taking care and kindness with nephew. Therefore, when the students wanted to eat the food, snack and carbonate drinking, grandparent spoiled them.

Environments around student's home:

-The environment of student's home had the convenient place for eating such as their home near market, their home sale snack. The students could buy or eat food and snack all the time.

3. The effectiveness of obesity control program

The program was developed based on the obesity control program from four DLHPS, review literature, and the participants of setting school. After evaluating the program in experimental group were significantly different with control group in many variables (p-value < 0.05). The evaluation the program was performed between experimental and control group the result found that some variables were also significantly different (p-value < 0.05). The calories of dietary intake per day, the energy expenditure per day, and body fat percentage, in control group had significantly higher than the experimental group, while the respondent's health perception score of their obesity was not significantly different (p-value =0.79). However, the variables of parents were not different both of the time and the group.

The summary of the activities for improvement the obesity control program in school could conclude in the below model of obesity control program in school as figure 4-11. Three major parts of strategy depicted that the healthy food in school, healthy knowledge in school, and healthy environment at home were the necessary component with normal nutritional status of students. Most activities in this model as same as with activities from 4 DLHPSs, but this model had higher number of activities than DLHPS such as nutrition education, vegetables planting at home, newsletter.

Three main activities could conclude as follows:

1) Healthy food in school included 2 activities about nutrition education for food cooker and healthy food activities. The food cookers were mentioned as a part in school level. They could participate in this program such as healthy food cooking and preparing for students in school, and nutrition education for food cookers. They could receive the healthy knowledge for applying the healthy food cooking for their students. These activities were necessary for program development.

2) Healthy environment at home comprised of 3 activities including nutrition education for parents, newsletter, and plant the vegetables at home. Parents could receive the nutrition knowledge for obesity controlling in their children. Newsletters for parents were sent for enhancing the nutrition knowledge. Therefore, parents could increase their knowledge for their child rearing. Moreover, activity of vegetables planting could build relationship between parents and their child. Children could use the leisure time for planting more than playing VDO game and watching TV.

Therefore, parents were mentioned as a key person for participation in obesity controlling in their children.

3) Nutrition knowledge in school composed of 3 activities about integrating the nutrition content to all subjects, healthy day/healthy corner, and exercise in the morning. Teachers were the key persons for conducting the obesity control content to all subjects for their students. Teachers helped to establish the healthy day and healthy corner for healthy knowledge distributing in school. Moreover, they could set the healthy activity such as exercise in the morning for their students. The three major parts of strategy led to the student level.

From Figure 4-11, the dashed line in model depicted the congruent among all activities and participant levels. The collaboration of three main persons including school, teachers, parents, and students was the key success factor in obesity control program as follows:

School:

School director and food cookers were participants in this part. School directors had to bring the nutrition policy to school, share responsibility to school health teacher, and monitor the program for continuation.

Food cookers were the persons who cook and prepare school lunch meal and food in school. When they receive healthy policy and nutrition knowledge from school health teacher and expertise, they could apply the knowledge from theory to practice. Therefore, they were the necessary person for obesity control program in school.

Teachers:

School health teachers were a very importance role because they were a key person in healthy project in school. She shared responsibility for activity performing to other teachers in school. Teachers conducted these activities as a team for goal achievement. Many activities that they could perform for normal nutritional status in their student such as integrate the nutrition content to all subjects, establish the extra activities about healthy day, healthy corner, and exercise in school.

Parents:

Parents could not take care of their student in school but they were the main person for caring their children at home. Therefore, all obesity control activities that performed with their children at home, they should continue conducting for increasing the rate of normal nutritional students. Teachers and parents could work because teacher could communicate about activities and nutrition knowledge to parents by newsletter and knowledge document. Therefore, teachers could perform obesity control activity at school and parents could perform continuous activities at their home. The benefit from this result would direct effect to students.

Students:

Students were the main center that all persons such as school director, food cookers, teachers, and parents should care about student's health. However, students had to receive healthy knowledge for awareness building in their obesity controlling.

Cooperation in this obesity program was necessary for goal achievement in normal nutritional status of children. If all persons focus on functions those they could do, this program will success. The participation was important to the success of the healthy program. School directors, food cookers, teachers, parents, and students were key players in moving the program forward.

Public health nurses were center to promote collaborative efforts between school staff and family. Their experiences in health and interpersonal skill were optimized for student's wellbeing. They help mediate and catalyze the participation of all sectors to reduce the number of overweight students, and increase the number of healthy students in school.

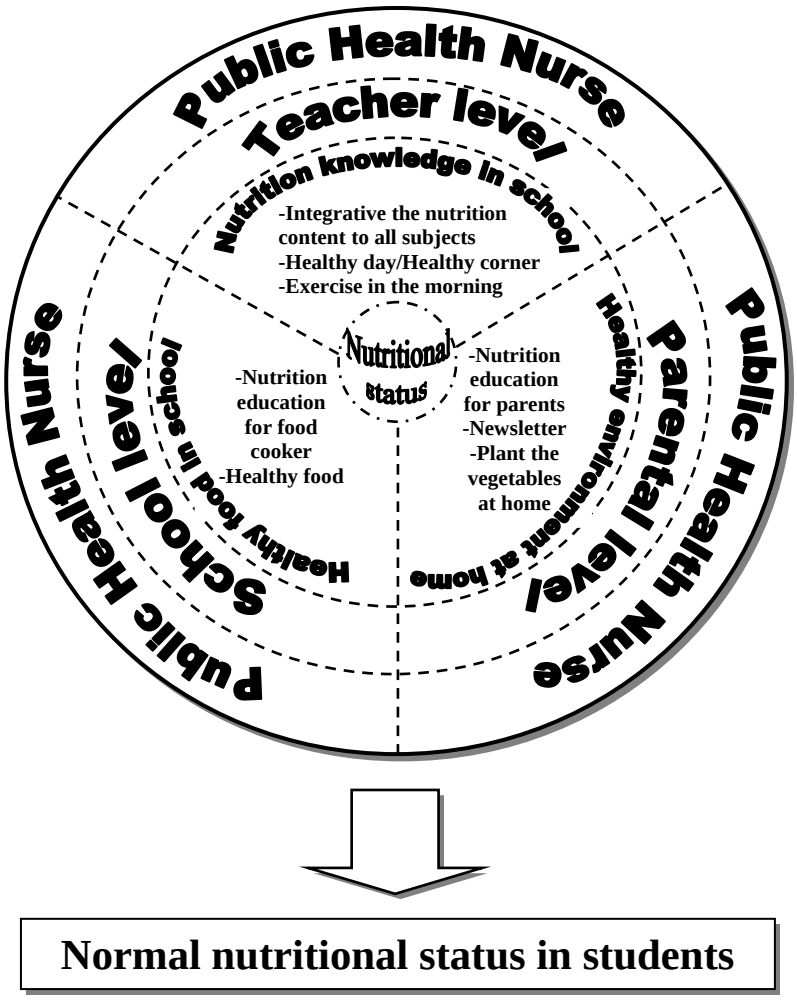

Figure 4-11: The model of obesity control program in school

CHAPTER V
DISCUSSIONS

The present study was mix method; the embedded experimental research design. This research included the collection of both quantitative and qualitative data starting the qualitative method in phase I and phases II to design, analyze strategies, and means of activities of obesity control program in four DLHPSs and literature review in success obesity prevention program. In phase III for intervention of obesity control program development in experimental school, the participants included school directors, teachers, food cookers, parents, and students. This phase has pre, during and posts measures for explanation the treatment results of obesity control program. The variables in this study were compared with control school. The computing descriptive statistics, chi-square, and the repeated measures analysis of variance were used in this study.

The research was conducted for eleven months, from May 2012 to March 2013. This discussion of the study is divided into 2 parts as follows:

1. The result from the obesity control program in school
    - 1.1 The obesity control program in DLHPS
    - 1.2 The outcome of the obesity control program in school
2. The process of the program development
    - 2.1 Phase I: Existing knowledge analysis
    - 2.2 Phase II: Program development
    - 2.3 Phase III: Implementing and program Evaluation

5.1 The result from the obesity control program in school

5.1.1 The obesity control program in DLHPS

The DLHPS is the highest award of health promoting school. These have the emphasis on the healthy children in school such as sustainable health activities/project in school, weight and height in normal linear growth, and strong nutrition policy for obesity prevention in school (Ministry of Public Health, 2005). Based on the finding of four DLHPSs by using the in-depth interview and focus group method in participants included school directors, teachers, food cookers, and students. The participants had the willing participation and feeling of accomplishment with proud in the obesity control program. The result was shown as follows:

5.1.1.1 The experience of leader in DLHPS

This study showed that the school directors and teachers had long period of time in their position more than 13 years and period of time for participation in health promoting school more than 5 years. Therefore, these experiences helped to establish the successful obesity control program in school.

5.1.1.2 The initiation of the overweight control project in school

The first reason in three of four schools had created the health promotion policy in school according to the health promoting school policy. From the studied of Terry & Grimm (2011) found that interventions focused on individual behavior change often rely on bottom-up approaches and have generally been less sustainable than policy interventions. Moreover, the policy could be developed to reduce the risk of obesity in children (Maynard et al., 2009). This study was consistent with other studies that were the reasons of the overweight control project that came from policy, the increasing of overweight students (Manora, Powwattana, Thaingtham, & Chongsuwat, 2010; Sirikulchayanonta et al., 2010), the health of students (Peunposop, Wongboonsin, & Kost, 2011), and referred to the low academic achievement score of students (Donnelly et al., 2009).

5.1.1.3 Process of project management and control overweight in school

School director distributed the policy and responsibility to every teacher in all schools. The main activity person was school health teacher. They would share responsibility for the implementation in each activity to other teachers. Teamwork was the necessary strategy to work as a team for healthy activity. The follow up for activity process had performed in the appropriate time for the mission achievement of school's strategic plan. According to other studies, the core persons to school health practices were school administrator (65.7%) and school health teacher (44.7%) (Kerddornphake & Tharakul, 2011).

5.1.1.4 The activity of obesity control program in DLHPS

The activities of obesity control program for students in DLHPS were divided by 3 activity groups included the build awareness of the overweight students, the healthy food, and exercise in school.

5.1.1.4.1 Building awareness of the overweight students

The DLHPS had the activities for build awareness for students such as integration of obesity control contents to all subject, healthy food and exercise in school, healthy corner in school and exhibition of health in school. The examples of obesity control contents for nutrition education such as the healthy food, nutrition label, fruits name in English language and benefit of fruits and vegetables. It was consistent with several previous studies. The build awareness of the overweight students in other studies suggest that should be provided some lessons for the nutrition contents to students (Boon, Clydesdale, & Clydesdale, 2005) by teaching the contents of food pyramid and the consumption of fruits and vegetables (Eisenmann et al., 2008; Jiang et al., 2007), take the media, books, informational handouts, educational workshops to students (Beth Yano, Ebesutani, & Lu, 2009), present the danger of obesity when their grow, such as the child was teased at school, the physical limitations to their activity (Howard, 2007). Moreover, the imagination of their future health is the nice build awareness that is if they do not change in body shape, they will receive the several disadvantages. The role model for students can build the inspiration

to students (Beth Yano, Ebesutani, & Lu, 2009). These results indicated that the build awareness in the overweight students helped to obesity control program in school.

5.1.1.4.2 The healthy food

For the healthy food in DLHPS of this study that shown the healthy food in cafeteria was emphasized on vegetables, fruits consumption and low sweet herb juice. According to other studies about no-sweet food and sugars intake activities of children found that after conduct the varieties of activities such as educate and promote the knowledge and attitude to reduce sugars intake of the students. Mean sugar intake of the students was serially decreased (Tripathi, Jiamsajamongkol, & Chokthanavanish, 2008). In addition, the removing the sweets and snacks out of kitchen (Beth, Yano, Ebesutani, & Lu, 2009; Miller, Moore, & Kral, 2011), discouraging the consumption of carbonated beverages and encouraging fruits intake (Doak, Visscher, Renders, & Seidell, 2006) were other strategies for reducing sugar consumption. The healthy food in school was the main activity to for obesity reduction in school.

5.1.1.4.3 Exercise in school

The exercise and sport in school by aerobic in the morning, exercise during the lunch time, and sport playing after study were obesity control strategy that helped to control weight of students. It was consistent with Donnelly, et al. (2009). They indicated that physical activity across the curriculum schools had significantly better changes in Body Mass Index. Moreover, other studies have promoting the physical activity replace the watching TV (Beth Yano, Ebesutani, & Lu, 2009) that was walk exercise at home (Jiang et al., 2007) and summer camp programs (Boon, Clydesdale, & Clydesdale, 2005). Therefore, all of physical activity and exercise help to reduce student's weight.

5.1.1.5 The success factors of obesity control program in school

The cooperation from all parties was the most successful factors in this project. School director brought the beneficial policy to the teacher team for health promoting school development. Including the parents could cooperate with activities and students could act the school policy assignment. The project management process and control overweight in school were cooperated by the

committee from all sectors. This was consistent with the previous study. It was found that should be enhancing the practical policy for all sectors and specifying the scope of role and responsibilities of each sector relevant to health activities (Kerddornphake & Tharakul, 2011). Most teachers could adapt to work for healthy students because teachers could provide with the opportunity to integrate some of the ideas into their classroom (Eisenmann, 2008). Thus, the obesity control program could succeed from the cooperation of participants.

5.1.1.6 The role of participation

5.1.1.6.1 Parents

The participation of parents could study from the statement of director of school, teacher, and food cooker. The parents participated in obesity control program. Parents helped to weight reduction and healthy food choosing in their children. This was consistent with Howard (2007). He showed the results that parents should perform the positive actions and role modeling by provide a wide variety of healthy choices for their children and allow considerable latitude in making decisions about food choices and quantity. Moreover, parents were key person to help the obesity control activities and built program continuation when children stay at home. The parents should perceive benefit of understanding the Body Mass Index (Stalter, Kaylor, Steinke, & Barker, 2011). Therefore, the program should be design the healthy meals and snacks by nutrition education and training workshops for parents (Eisenmann, 2008) or distributed the newsletters to encourage parents (Eisenmann, 2008; Howard, 2007).

5.1.1.6.2 Food cookers

Based on the food cookers activity in DLHPS, the result found that food cookers should have the healthy food preparing knowledge. They could select healthy food to school and prepare school lunch meal by appropriate proportion for students. Gronbaek, Madsen, & Michaelsen (2009) suggested that food cookers in school could reduce the fast food, drinks, sugar and sweets consumption, and increase the vegetables, fruits and whole-grain bread intake. Moreover, they could change the food cooking such as replacing from the frying to baking ovens and steaming (Greening, Harrell, Low, & Fielder, 2011). Therefore, food cookers were the

key persons who had knowledge for healthy food choosing and preparing in school. The nutrition education for this group should perform in this program.

5.1.1.7 Lessons learned and barrier of obesity control program in school

The lessons learned of obesity control program in school were work cooperation from every parts and the benefit healthy knowledge from healthy project. The problem, barrier and strategy of the obesity control program of this study included the criteria of diamond levels health promoting was confusion, Public health officer helped explained about the document writing in late time, parents did not participate with project, and the students did not cooperate in vegetables and healthy food consumption. It was consistent with Kerddornphake & Tharakul (2011). They revealed that the problems and barriers in school health practice of Thailand could be divided into 4 aspects as policy, personnel, collaboration, and resource mobilization. If school could solve these problems, they would conduct the obesity control program in school. Peunposop, Wongboonsin, & Kost (2011) offered that the childhood over nutrition control in Thailand had an unsuccessful due to the lack of a national agenda on childhood over nutrition, inadequate funding, poor quality nutritionists and health personnel, and poor cooperation from families, school and the food industry. Moreover, the policy of nutrition which address both individual (knowledge about healthy eating behaviors and lifestyles) and environmental factors (schools, food stores, and media and food advertisement) influencing unhealthy diet behaviors of Thai people (Phulkered, Pongutta , Thamarengsi, & Patcharanarumol, 2011).

According to the contents of obesity control program in the DLHPS, the benefit of obesity control process in school could apply in this program and other schools by focusing on the context of school for reducing the overweight and obesity in student. These results showed that the policy of healthy food in school was main component of obesity control program. When the school principals received the policy from MOPH, process of implementation by appointing the responsible person and continue monitoring help increasing the success.

5.1.2 The outcome of the obesity control program in school

The number of experimental students was 40 persons while the number of control students was 44 persons. This control group did not receive the obesity control program. The finding of this study showed 1) the perception of their obesity; 2) the consumption behavior such as a) the frequency of meal consumption, b) the type and frequency of snack or food between meal consumption per week, c) the food frequency questionnaire for children in school (24 hour recall), d) the carbohydrate, protein, and fat of dietary intake per day; 3) the physical activities and exercise behavior; 4) physical fitness; 5) the nutritional status; and 6) the adiposity outcome and the body fat percentage.

The outcome and output testing between experimental students and control students included 1) the respondent's health perception of their obesity, 2) the body fat percentage, 3) the calories of dietary intake per day, and 4) the energy expenditure per day. These results were shown in this part.

5.1.2.1 The perception of their obesity

The experimental students and control students in Time 1, 2, and 3 had respondent's health perception of their obesity in moderate level. Moreover, there was no significant difference between experimental and control group. According to the perception concept, perception is the interpretation of sensory information in order to represent and understand the event or environment. Perception can be shaped by learning, memory, and expectation (Schacter, Gilbert, & Wegner, 2011). The reason of this result might be inferred that the effect of program development could not increase the perception in their obesity because the students might be too young and they were not ready to understand in their problem for short period of time. Therefore, the researcher should add more awareness and knowledge to students for creating the perception of their obesity and supported the teacher for continuing the obesity control program in school. This result contrasted with the results of other studies of child's weight self-perception and child's desire to lose weight. They indicated that the interventions of promoting healthy weight perceptions for pediatric weight management helped to reduce weight in children (Huang et al., 2009).

In the same way, the result of the parent's perception of obesity in their child in this study was not different. This result revealed that the parents had not perception of their obesity. The parents were the persons who cared their children. Lack of knowledge about nutrition and unhealthful food preparation practices were the part of barriers to healthful eating in children (Rodriguez-Oliveros et al., 2011). The previous study found that most parents of students concern their child's weight and perceive obesity as a problem. (Jaballas et al., 2011; Marvicsin & Danford, 2013). Some parents of overweight children were not concerned about the risks associated with overweight from their child's weight status that effected to child weight loss interventions (Towns & DT Auria, 2009).The reasons of the parents had not perception of their obesity might be come from the parent considered their child was overweight but did not perceive a related health risk (Park et al., 2013) and the parent expressed concern with their child's weight (Polfuss & Frenn, 2012).

5.1.2.2 The consumption behavior

The frequency of meal consumption; the type and frequency of snack or food between meal consumption per week; the food frequency questionnaire for children in school (24 hour recall): the carbohydrate, protein, and fat of dietary intake per day were assessed in term of the consumption behavior of students.

(a) The frequency of meal consumption: The frequency of meal consumption of Time 1, 2 and 3 in control students was higher than experimental students both of study day and holiday. Moreover, the snack frequency in before breakfast, mid morning, mid afternoon, and after dinner in control students was higher than experimental students both of study day and holiday.

At the present, Thai children change eating behavior by emphasized on high-calorie foods, sweet food, and snacks that effect on overweigh and obesity in children (Sirikulchayanonta, 2010). It was consistent with the study of Forslund et al., (2005).They found that obese subjects were more frequent snackers than reference subjects because snacks were positively related to energy intake. Moreover, other studies found that mean energy intake from snack in obese group was significantly higher than for non-obese group ($p< 0.001$) (Yoon & Lee, 2010). The possible reasons might be decreasing in the snack consumption number during

program intervention. This result indicated that the consumption behavior had to use the time to changing behavior.

(b) The type and frequency of snack or food between meal consumption per week: After finishing program, experimental students did not improve in healthy food consumption because they liked unhealthy food consumption. The finding of most students (both of experimental and control group) consumed snack, fast food, soft drink, fruits juice, and fruits in everyday while Thai dessert, bakery, and candy and chocolate were not consumed by most students. Moreover, most students consumed the soft drink for sometimes. When considered the nutritional status of experimental students was improved despite frequency of snack consumption not decreased in Time 1, 2, and 3. It was consistent with the study of Keast, Nicklas, & O'Neil, (2010). They studied snack and overweight and abdominal obesity. The results finding, the prevalence of overweight and obesity decreased with increased snacking frequency because who snack regularly consumption may be more successful at managing weight by the replacement of fat with carbohydrates. It is possible that snackers exercise more than nonsnackers.

(c) The food frequency questionnaire for children in school (24 hour recall): The consumption behavior in experimental students was decreasing trend in the mean of the calories of dietary intake per day at 3 times while it was increasing trend in control students. When considered in both groups found that the control group had the calories of dietary intake per day higher than the experimental group. The result of consumption behavior of study found that the frequency of meal and snack consumption in control students was higher than experimental students both of study day and holiday. However, after finishing program, experimental students had not improved in healthy food consumption although they could decrease the calories of dietary intake per day. The possible reasons of this result were more quality of food and snack in experimental students both of school and their home. It was consistent with Angelopoulos et al., (2009). They found that intervention group had lower consumption of fats/oils and sweets/beverages than control group after school-based intervention program. These results highlight the importance of developing a social and physical environment for promotes balanced eating behaviors.

The trend of the calories of dietary intake per day in control group was higher than experimental group and had increasing trend in Time 3 (Figure 4-8). When considering the trend of calories of dietary intake per day in Time 1, 2 and 3were significantly decreased in both groups. This result indicated that the obesity control program decreased the calories of dietary intake per day at Time 2 and Time 3 when compared with Time 1 or before program intervention. The result showed that students were interested in the energy of dietary intake per day although they had snack consumption. It was confirmed with Caballero et al. (2003). They revealed that total energy intake (by 24-h dietary recall) was significantly reduced in the intervention schools. However, the calories of dietary intake per day at 3 times in the parents were not different. This result contrasted with the results in other studies of healthy intervention and informative that helped to increased nutrition knowledge in parents (Jacobson & Melnyk, 2012). Moreover, the study of Raynor et al., (2011) found that parent intake was consistently related to child intake. Thus, changing parent intake may be important in helping to change the dietary intake of young children with overweight and obesity.

(d) The carbohydrate, protein, and fat of dietary intake per day

The nutrients of dietary intake per day especially carbohydrate, and fat in 3 Time of experimental group were decreased while control group were increased.

According to the Thai RDI (Thai Recommended Daily Intake) is the food quantity that recommend for Thai people older than 6 years old by calculated from energy of dietary intake 2,000 calories/day. They should receive carbohydrate 60 % (300 grams), protein 10% (50 grams), and fat 30% (65 grams) per day (Thai RDI, 2013).Therefore, the calculation for child age 6-8 years old or 1400 Kcals./ day was occurred. The quantity of nutrients per day was 210 grams in carbohydrate, 35 grams in protein, and 45 grams in fat. For experimental group, the carbohydrate intake per day of students was lower than Thai RDI; however, fat and protein per day was similar with Thai RDI criteria, as shown in Figure 4-6. For control group, the carbohydrate intake per day of students was lower than Thai RDI; however, fat and protein per day was higher than Thai RDI criteria, as shown in Figure 4-7.

The result from the previous study confirmed that weight-loss diets with different compositions of fat, protein, and carbohydrates were strongly associated with weight loss (Sacks et al., 2009). On the contrary, the study of Maier et al., (2013) revealed that nutritional intake of normal weight and overweight children no differences in energy and macronutrient intake.

From the physiology in body of children found that this age group (6-12 years old) had many transition changes such as size, shape, muscle, fat and hormone. Therefore, they had to use more energy from dietary for growth development. The total energy was 1400-1600 Kcals. for this age group that they received from the both macro and micro nutrients. The macro nutrients composed of carbohydrate, protein, and fat that were necessary dietary component for children. The average of carbohydrate, protein, and fat per day in 6-13 years old were 8 ladles, 6 tablespoons, and 4 teaspoons, respectively. However, the dietary consumption was controlled for normal nutritional status. Therefore, all activities in obesity control program helped to consume the appropriation of food per day and did not interrupt with the growth development of children.

5.1.2.3 The physical activities and exercise behavior

The mean of the energy expenditure per day at 3 times of experimental and control group was increased in all nutritional status groups. However, the obesity group of control group was decreased. When considering the trend of energy expenditure per day in both groups, found that the experimental group had the energy per day lower than the control group. However, the trend of the energy expenditure in Time 3 of experimental group was increased and had significantly increased from Time 1, 2, and 3, while control group was decreased, as shown in Figure 4-9. Moreover, the physical fitness examination at 3 times found that in experimental group was better in all types of these, while control group was better in 3 of 5 physical fitness examination activities. This result indicated that the energy expenditure of experimental group had the increasing trend after finish the obesity control program. These findings were consistent with previous studies which physical activity across the curriculum in experimental schools had significantly better changes in daily physical activity than control school (Joseph et al., 2009). The possible reasons of this result were more exercise in experimental students both of school and

their home. The obesity control activity helped to exercise in students such as exercise in nutrition education, physical fitness examination and exercise in the morning. Moreover, the exercise in their home that control by parents and plant the vegetables in their home was one strategy for benefits of leisure time of family. Most students liked exercise, thus the obesity control program improved the physical activities and exercise behavior at Time 2 and Time 3 when compared with baseline or before program intervention. The previous study indicated that the sedentary behaviors decreasing were an effective intervention to control weight in children (DeMattia, Lemont, & Meurer, 2007).

For the parents, the energy expenditure per day at 3 times was not different. This result contrasted with the results in other studies of healthy intervention that were the informative of obesity prevention helped to increased physical activity knowledge in parents (Jacobson & Melnyk, 2012). Therefore, physical activities and exercise behavior in parents could prevent obesity in students and should support the exercise for parents. The recommendation of the BEE (basal energy expenditure) for people per day was showed as formula; For men = BEE = 293 − 3.8 × age (years) + 456.4 × height (meters) + 10.12 × weight (kg) and for women= BEE = 247 − 2.67 × age (years) + 401.5 × height (meters) + 8.6 × weight (kg). (Gerrior, Juan, & Peter, 2006).

5.1.2.4 Physical fitness

The physical fitness examination were examined by push-ups 30 seconds, sit-ups 60 seconds, sit and reach, standing broad jump, and zig-zag run. The trend of these activities in three times of experimental group was better. For control group, some activities was better including push-ups 30 seconds, sit-ups 60 seconds, and zig-zag run whereas 2 activities did not change, including sit and reach and standing broad jump. Accordingly, experimental group had better in physical fitness than control group because they had received the physical activity such as exercise knowledge and exercise in the morning. The result from the previous study confirmed that the interventions of children's physical activity were most effective in the school setting composed of physical education lessons, incorporating curriculum, activity breaks, and family strategies (Salmon et al., 2007).

5.1.2.5 The nutritional status

In experimental group, the nutritional status of all students in three times was improved. The result finding found that the prevalence rate of obesity students in the Time 1 of the study was 45.0 % and slightly decreased to 47.5 % and 32.5 % in Time 1 and 2. The result found that the number of obesity students was decreased, while the number of normal nutritional status was increased. In control group, the prevalence rate of overweight students in the Time 1 and Time 2 was 27.3 % and increased to 29.5 % in Time 3.

This was referred that obesity control program could be used to control overweight student when compared the time before program intervention. The control students did not receive the obesity control program. Therefore, they could not improve in nutritional status. The possible reasons of this result were more activities for implementation the obesity control program such as the nutrition education, healthy food, exercise in the morning, healthy day, and plant the vegetables at home were combined for this program.

According to the physical development of school children, this age period have the many transition changes occurring such as size, shape, muscle, fat and hormone. All children grow rapidly between 9-15 years old. However, elementary school years have slower than adolescence. The growth development of school age children have the slowly growth. The height has increased about 5-6 centimeters per year (Malina, 1990; Tanner, 1990). Thus, the appropriation of food and exercise in this obesity control program help to support the growth status of elementary students. This finding of obesity control intervention and weight reduction was consistent with previous studies of Millar et al., (2011) and Seal & Broome, (2011). They found that the obesity control program affected with the nutritional status of students. Moreover, the study of Jiang et al., (2007) & Millar et al., (2011), they conducted the interventions about building the capacity of families, schools and communities to promote healthy eating and physical activity. The result found that after finishing program the prevalence of overweight and obesity and in body mass index were significantly lower in the intervention schools than in the control schools.

5.1.2.6 The adiposity outcome and the body fat percentage

The adiposity outcome of experimental group was better changing than Time 1 and control group. Waist circumference, skin fold thickness at triceps and subcutaneous in Time 2 and 3 was better changing than Time 1 in experimental group, while skin fold thickness at subcutaneous in Time 2 and 3 was better changing than Time 1 in control group. The possible reason was the experimental study performed the all activities in obesity control program that concluded the healthy food and exercise. It was consistent with the study of Yan-Ping et al., (2009). They found that the diet-oriented intervention could decrease waist and hip circumference.

The body fat percentage of student was assessed at three times. The results found that it was significantly different between experimental and control group. The line graph presented changes at three periods in term of mean scores, as shown in Figure 4-10. The body fat percentage of experimental group was lower than the control group. Based on this finding, trend decreased at Time 2 and slightly increased at Time 3 in experimental group. The results inferred that the obesity control program improved the body fat percentage after completing the program when compared with baseline. This was referred that obesity control program could be used for obesity control in overweight student. This result confirmed the studied of Farris, Taylor, Williamson, & Robinson, (2011). They revealed that body fat percent, and waist circumference approved when received the obesity prevention intervention. This intervention combined with physical therapy, nutrition, exercise and fitness positively affected with BMI, body fat percent, and waist circumference. However, it was contrasted with Caballero et al., (2003). They studied the intervention that included 4 components: 1) change in dietary intake, 2) increase in physical activity, 3) a classroom curriculum focused on healthy eating and lifestyle, and 4) a family-involvement program. The intervention resulted in no significant reduction in percentage body fat. The body fat percentage from this study came from the equation of body fat percentage in children age 4-10 years old (Dezenberg et al., 1999; Pratanapon, 2006) that brought the weight, skinfold thickness at triceps, subscapular for calculation. Therefore, this program could reduce the fat in children's body after they received the several activities from obesity control program.

According to the physical development of school children, the subcutaneous fat will develop about 9 months after birth and layer of fat thickness will reduces until 6 or 7 years old after that it increase until adolescence (Tanner, 1990). However, the body fat percentage in this study was decreasing trend when compare between Time 1 and Time 3. Therefore, the obesity control program could be employ for obesity control program.

In summary, all eight activities could help to increase the healthy food consumption and physical activity behavior, and nutritional status. This obesity control program should perform in all schools that have the obesity in students. The cooperation of all sectors such as school director, teachers, food cookers, students, and parents was key success factor in healthy project.

5.2 The process of the program development

The process of program development of the obesity control program for students consisted of three phases: 1) existing knowledge analysis, 2) program development and 3) implementing and program evaluation. The discussion of each phase is presented as follows.

5.2.1 Phase I: Existing knowledge analysis

This phase composed of in-depth interview and focus group meeting. This phase employed qualitative data collection method to design, analyze strategies, and means of activities of the obesity control program from the 4 DLHPSs. The method for objective achievement was performed by in-depth interview and focus group method as follows:

5.2.1.1 In-depth interview method

The in-depth interview method was used in school directors, teachers who were responsibility in obesity control program and food cookers. This method used the content analysis process that composes of preparing data, coding data, integrating data and conclusion data (Zhang & Wildemuth, 1996). The aim of in-depth interview method was to study the processes of the obesity control program or project development. The trustworthiness issues of the study were discussed in terms

of the criteria suggested by Lincoln and Guba, (1985): including the credibility, dependability, transferability, and conformability. The *in-depth interview* was a qualitative method for analysis, which proceeds as a confidential and secure conversation between an interviewer and a respondent. Therefore, the contents that received from in-depth interview could use for adjustment in obesity control program in experimental school.

5.2.1.2 Focus group discussion method

The focus group discussion method was used in students who participated in obesity control program in school. The purpose for focus group discussion in students was to increase understanding of the activities and benefit of obesity control program in school. The question had the objective to design, analyze strategies, and means of activities including learn about key success factors and barriers for conducting program. The members could help to answer, discuss, share opinions, and experience in the contents of obesity control program in school. According to the concept of focus groups discussion found that this method could select the participants who had direct experience about the interesting topic (Stewart et al., 2007). Moreover, this method could help explore or generate hypotheses, develop questions or concepts for questionnaires and interview guides. The advantages of focus group were the participants as it could be an opportunity to be involved in decision making process (Gibbs & Anita, 1997). This method had the useful in providing the opinions among participants for conclusion the answer. Therefore, this method appropriated with children that they could help to discuss and share their ideas in the group about the obesity control program in their school. For the result of these methods could succeed in the objective achievement.

5.2.2 Phase II: Program development

In this phase focused on the experimental school that had the overweight students in school this school was Christasongkroc School. After the phase I, gathering the data that received from each DLHPS were combined with previous studies that succeeded in obesity control of school. This obesity control program would describe and transfer for program identifying to experimental school. Planning program step was created by the participants in this school for the activities setting .This step

emphasized on collaboration among teacher, students, parents and researcher. The several advantages occurred in this method such as the activity from DLHPS and previous study were the real activities that implemented in the success obesity control program. However, the participants in setting school could review all activities from DLHPS and previous studies for adjustment and conducting in their school. Therefore, this method was the appropriate for the participants in setting school because these activities were the best activity and they could select and adjust the activities by themselves. The main activity in this study was group meeting in students, parents, and teachers for the details as follows:

5.2.2.1 The students meeting

The student group meeting was performed by free discussion and shared their ideas about childhood obesity problem in school. The A-I-C technique in this study applied from guideline of Smith (1991). The results of student group meeting found that students could identify and present current situation, risk factors and problems of childhood obesity. The activities that they suggested to develop the obesity control program in school included exercise in the morning and plant the vegetables at school or home for students. They interested in all activities from 4 DLHPSs and accepted the pattern of this activity. All students participated with program by willing participation.

5.2.2.2 The parents meeting

The A-I-C technique was used in this group and the similar activity of students meeting occurred in parents' group. All parents had the awareness in their overweight children. They accepted and participated in program. The extra activities that parents offered for adding in obesity control program were disadvantage of soft drink and snack for nutrition education in students.

5.2.2.3 The teachers meeting

The teachers presented the real situation about the cause of obesity in students and the relationship of obese students and food, exercise, and child rearing of parents. Every teacher drew the healthy children or normal body shape in the future. All activities from DLHPS and previous studies were adjusted for using in school. They accepted for integration the obesity control content in all subjects and helped to create the worksheet between their subject and obesity control content.

These 3 groups employed the A-I-C technique because this method appropriate with study. A-I-C technique method was a process that helped to recognize the centrality of power relationships in development projects and encourage stakeholders to create the activities of project within the factor that influence the project. The advantage of A-I-C technique was all participants in this technique could build the big picture for program implementation (Smith, 1991). From the process of this study could build the perception about child obesity and conduct the appropriate activities for obesity controlling in school by the collaboration with all participants. It was consistent with Phadaennok (2010) using AIC technique to develop the healthy program in community. The results revealed that the score of community participation after implementing an action plan based on the AIC technique was statistical significantly higher than the score before the implementation because the participants were interesting in awareness building and they could participate in all activities from the cooperation in healthy program.

5.2.3 Phase III: Implementing and Program Evaluation

The obesity control program that received from phase I and II was leaded to phase III in experimental school for development and test the new program. Therefore, quasi- experimental method was used to examine and evaluate the obesity control program for effectiveness checking of program in an experimental school by results comparing with a control school. The researcher role acted as an educator, and organizer to manage the participants in the program. The obesity control program was informed in students, teachers, food cookers, and parents as follows:

5.2.3.1 The obesity control program in students

Six activities for students focused on 1) nutrition education, 2) healthy food, 3) exercise in the morning, 4) healthy day, 5) plant the vegetables at home, and 6) nutrition assessment and physical fitness assessment were occurred in this program. Nutrition education included the teaching knowledge and workshop. The contents of nutrition education were taught by game, workshop, and demonstration for six times. Healthy food in school was emphasized on the fruits and vegetables in lunch meal and food in school by food cookers who were received the healthy knowledge. Ten minutes per day in the every morning was set for aerobic dance by the

collaboration with students, research team, and nutrition education and physical teacher. The big activity or the healthy day was performed from students, nurse team, and research assistant team who supported the healthy instrument, reward, and food for activity. Plant the vegetables at home was the activity that students liked because student could plant by themselves. Nutrition assessment and physical fitness assessment were the activity that performed to follow the results of obesity control program. These activities were assessed for 3 times. The results of the obesity control program indicated that most students paid attention and participated in this activity.

These activities supported to build awareness about the obesity and helped to reduce the number of obesity in students. The findings of study were consistent with many previous studies in which the students participated in obesity control program by using several activities that are healthy food, exercise, fitness, and knowledge building about obesity (Millar et al., 2011; Seal & Broome, 2011).

Moreover, the parental involvement, behavioral modification, and monitoring after intervention were performed in the previous studies. These previous researches could increase the obesity control knowledge and skill of obesity prevention in student (Farris et al., 2011; Seal & Broome, 2011). According to the activities, the obesity control program had to have the several activities for reducing and controlling the number of obese students by consistence with the previous study.

For example, Sharma & Lekes (2011) studied the prevention interventions of childhood obesity. The results found that interventions should be included behavioral (change individual behavior), social (attempt to change individual behavior by social and peer norms) and environmental approaches (altering policies, surroundings and/or access to resources) and community-based, home-based and school-based programs. Thus, the multi activities to perform in the obesity control program helped to reduce the obese students in school. The accomplishment of program came from many activities that helped to support the obesity control program.

5.2.3.2 The obesity control program in teachers

The integration of obesity control contents in to all subjects was major activity of teacher for build awareness in their students. Teachers could establish worksheet including the nutrition content to all subjects. Teacher who taught the Arts subject created the content of worksheet by put the picture of healthy and

unhealthy food for planting. All teachers could create the worksheet that related with knowledge of nutrition and obesity controlling by participation of students.

The benefit of this activity was students could learn about healthy or obesity control contents all the times that brought to realize their nutritional status and prevention. It was consistence with Martins et al., (2010). They offered that should be put the physical education in curriculum of primary school children to continue the physical activity and exercise in school for obesity prevention. Moreover, Jose & Loise, (2006) founded that the "Obesity Prevention in Pediatrics" curriculum appeared to improve obesity prevention knowledge. Thus, the integration the obesity control has the benefit for obesity control in students.

5.2.3.3 The obesity control program in food cookers

Four times of nutrition education were activities in food cookers. When they participated in this activity, they could enhance their knowledge about cause, effect, prevention of obesity, weight controlling, and knowledge of food portion for preparing and consumption according to flag nutrition and 9 food protocols. Therefore, food cookers could have knowledge enhancing. This was consistent with Greening et al., (2011). They introduced the intervention school's food service by food cookers healthy food preparing. Moreover, Gronbaek et al., (2009) offered that reducing the fast food, drinks containing sugar and sweets intake, increasing the vegetables and fruits, and whole-grain bread intake in school helped to weight reduction. The benefit of nutrition education in food cookers was they could ask, discuss, and inspire the obesity control contents. Therefore, the food cookers could receive the healthy knowledge for healthy food development in their school. This could enhance sustainability of obesity control program in school.

5.2.3.4 The obesity control program in parents

Nutrition education and newsletter were performed during the implementation period. Two nutrition educations in parents could enhance their obesity control knowledge for obesity prevention in their children. The result of the nutrition education indicated that few parents participated in the classroom because they had work. The research had other strategies for knowledge sending to parents that was newsletter. However, nutrition education method in parents was consistent

with Jiang et al., (2007). They suggested that the nutrition education in parents could help their children decrease the energy intake and consume a balanced diet.

The newsletter method increased attention and interested in the parents. Moreover, the researcher had the statement of inspiration for weight control and thank you the students and parents for participation in obesity control program. It was consistent with Haire-Joshu et al., (2008). They selected the newsletter, and story board for early intervention of childhood obesity prevention. The newsletter method was one method for knowledge sending to parents. The parents should be received the healthy knowledge and activities in school for collaboration and continuity of activities.

When finished the implementation for obesity control program, Home visit was occurred for the parents for build relationship and encouragement in obesity control activity at home. Three homes were selected by purposive students in each educational level (Grade 1 to 3) who were still overweight after participation in obesity control program. Three students were selected by purposive selection from the available areas of student's home and allowance of parents for home visit. The purposes were health promoting and nursing care in patient and their family for continuing care, holistic care, self care, and patient-family participation (Rice, 2006).

The knowledge document, manual, and poster were clarified and distributed to parents. The several questions were asked for the obesity problem in their children. Most parents revealed the cause of obesity in their children that occurred from the consumption behavior of student such as the frequency of meal consumption per day and snack/carbonate drinking consumption. Moreover, the parents spoiled them, when they wanted to eat the food, snack and carbonate drinking. This activity helped to encourage the parents for create awareness of obesity in their children. Parents could consult about the children problem with the researcher by privacy. While the researcher suggested with parents about this problem, all parents intended to resolve this problem such as the control in dietary consumption and exercise behavior in their children. Thus, this activity could help to parent for obesity control in their children. After finishing home visit, parents had the inspiration for weight control by reducing the obesity factor in their children. Moreover, parents

wanted to have the obesity control program all the time in school. They hoped that the sustainment of program came from participation of school and home.

This finding of parenting and obesity was consistent with previous studies which cared informal children pattern. This was increased risk of overweight (Pearce et al., 2010). The second component of obese children was the environment of student's home. The convenient place for eating was effect to weight of students. The students could buy or eat food and snack all the time because their home was near the market and their home sale snack. Environments in and around student's home were referred to obesity in children. The previous study of Crawford et al., (2000) supported that the home environment was important because it influencing children's BMI. The home based early intervention was effective in preventing the early onset of childhood overweight and obesity. Therefore, home visit activity helped to prevent the obesity in children (Wen et al., 2007).

In summary, the process of the program development was appropriate with objective in this study. Lessons learned and experience that received from research process was the best benefit for healthy program development. The researcher could develop the obesity control program by participation with school director, teachers, food cookers, parents, and students. All activities could help to increase the healthy food consumption and physical activity behavior, and nutrition status. Therefore, eight activities that received from this study were the appropriate activities for obesity control program in other schools that have the obesity problem in students.

CHAPTER VI
CONCLUSIONS

This research was performed for study the lessons learned of obesity control program from the DLHPS, to design, analyze strategies, and means of activities of obesity control program from the DLHPS and to develop and test the new program with participation from school, students, and parents. The participants from four DLHPSs included the school directors, teachers, food cookers, and students. When received the obesity control program from these role model schools by in-depth interview, review literature, and participants in setting school, the researcher brought the obesity control activities from these resources to setting school or experimental school. The participants from experimental schools included the school directors, teachers, food cookers, parents, and students. The number of students participated with study was 44 and 40 students in experimental students and control students, respectively. Experimental and control students were compared for test the obesity control program evaluation. This study was conducted by three phases for objective achievement including the Phase I: Existing knowledge analysis, Phase II: Program development, and Phase III: Implementing and Evaluation program.

This section is presented the conclusion in research results of three phases of study, lessons learned, limitations, disadvantage, recommendations, and future research as follows.

6.1 Conclusions

6.1.1 Existing knowledge analysis

Existing knowledge analysis was used to study the lessons learned of obesity control program from the DLHPS, to design, analyze strategies, and means of

activities of obesity control program from the DLHPS. This phase was conducted in June – July 2012.

The method for conducting the result from this objective was in-depth interview and focus group discussion. Participants were 4 school directors, 8 teachers, 6 school food cookers, and 36 students. The results found that 7 themes revealed from 14 answers. The findings of theme and answer as 1) the initiation of the obesity control program in school included the policy of health promoting school, the number of overweight students increasing that referred to health of students and the academic score of students, 2) process of project management and control overweight in school was started by school director and distributed the policy including the responsibility to every teacher in all schools. School health teacher was main activity person for sharing the responsibility to the other teachers. Moreover, teamwork was the important strategy for healthy activity in school, 3) the activity of obesity control program in DLHPS. Three activities for students were concluded from these schools that included the build awareness of the overweight students, the healthy food, and exercise in school. Nutrition education, integrating content of obesity prevention in all subjects, the message sending to parents for giving the knowledge at home, launch the healthy school lunch by focusing on vegetables eating, exercise in the morning and the appropriate time were the example activity in DLHPS, 4) the barrier of the obesity control program for school directors found that the barriers occurred at first time of activity such as parents did not understand with healthy food in school, students could not eat vegetables and healthy food, the workers confused about the DLHPS criteria. For teachers, some teacher had the workload from the activities and paper work of obesity control project. However, they could adjust their work. Nutrition education was the strategy for solving these problems, 5) lessons learned of obesity control program in school were work cooperation from every part and all parties. The healthy project not only the students received the benefit but also all workers had the healthy knowledge and activities from program, 6) the successful factors of obesity control program in school were the cooperation from all workers. The beneficial policy from school director sent to all teachers for healthy development in school. The parents and students could perform according to the school policy assignment, and 7) the projects and activities in the future, they planned to continue the health programs and activities

in school because that was the health promoting school. Moreover, they hoped to have the school health nurse in school and others healthy activities in school including the distribution this activity to community and other schools.

The students were the center of obesity control project in school. The information from students by focus group discussion method helped conclusion all benefit of project as 1) the obesity control program participation of students showed that all students could participate with the activities such as fruits, vegetables, and herbal drinking with low sugar consumption, exercise in the morning, lunch and evening time, and healthy food in school, 2) the popular of activity, most students liked all activities both of exercise in the morning and healthy food consumption, 3) the effect of healthy food and exercise to their weight; after the activities was performed, all students knew the useful of healthy food consumption and exercise that helped to reduce weight and fat. The other benefits such as healthiness, shapeliness, freshness, cheerfulness were the positive result that students received from project, 4) the continuing of obesity control program; all students knew about the advantage of each activity in project, thus they wanted to continue the project. Although they had normal shape, they would participate in this project for normal weight status, 5) the obesity in parent of students and strategy; most students had the obese members at home. They had the strategy for weight reduction in their members such as healthy food and exercise/sport activity in family. The activities from DLHPS would combine with review literatures. The obesity control contents from 11 articles were selected from 2 databases for the best activity. The conclusion of obesity control activities between 4 DLHPSs and literature review from 11articles. The activities were divided by the 8 items as 1) nutrition education for students, parents and food cookers, 2) healthy food for students, 3) exercise in the morning for students, 4) healthy camp for students, 5) teachers meeting for integration of contents to all subjects, 6) newsletter for parents, 7) plant the vegetable at school or home for students, and 8) nutrition assessment, physical activity and perceptions assessment for students/parents and physical fitness assessment for students.

The results from this phase were all activities that could bring from DLHPS and previous studies to participants for development and implementation of

obesity control program in experimental school. Moreover, participation of all parties was the key success factor for program development.

6.1.2 Program development

This phase was aimed to obesity control program development by participants in experimental school base on qualitative data of DLHPS. This phase was conducted between August and September 2012. The participants in Christasongkroc School such as students, teachers, and parents were invited to set activity for controlling obesity in school by using group meeting, identify problems and factor of obesity in students, and A-I-C technique. The method of A-I-C technique consisted of 1) appreciation; share ideas and discussion, 2) influence; identify the best development activities or project and set their own development priorities, and 3) control; action plan setting flam and responsibility.

From the A-I-C technique, the researcher could conduct the 8 activities in the obesity control program as 1) nutrition education in students, parents, and food cookers, 2) healthy food in school, 3) exercise in the morning, 4) healthy day/ healthy activity, 5) teacher meeting for integration of nutrition contents to all subjects, 6) newsletter for parents, 7) plant the vegetables at home, and 8) nutrition, physical activity, perceptions, and physical fitness assessment in students.

The results from this phase were the activities that came from the adjustment of participants in experimental school. These activities could bring to develop obesity control program in the next phase.

6.1.3 Implementing and Evaluation program

The implementing and evaluation program was carried out three times that was before program intervention, during program intervention, and immediately after program intervention. This phase was conducted between October 2012 and March 2013. Six months totally for the implementing and evaluation period.

The results of study revealed that the effect of program development could improve several factors from obesity control activities in experimental students as follows:

The children's perception of their obesity:

The results revealed that children's perception score was moderate level in both groups.

Children's consumption behavior:

-Frequency of meal consumption

This result found that most experimental students consumed breakfast, snack mid morning, lunch, and dinner meal in study day and consumed breakfast, lunch, and dinner meal in holiday, while most control students consumed every meal except snack after dinner meal in study day and consumed every meal in holiday.

-Type and frequency of snack or food between meal consumption/week

Experimental students did not consume Thai dessert, bakery, and candy/chocolate, while control group consumed all types these foods.

Physical fitness:

Experimental students had better changes in all 5 activities, while control students had better changes only 3 of 5 activities.

Nutrition status:

Experimental students had better changes, whereas control students did not have any improvement.

Adiposity outcome, **waist circumference, and Skinfold thickness:**

Experimental students had better changes, while control students were did not have any improvement.

The experimental school was intervened the implementation and control school was compared the outputs and outcomes of study. When compared between the experimental group and control group, the results found that the number of obese students in experimental group lesser than control group. Moreover, some variables were also significantly different such as the calories of dietary intake per day and body fat percentage in control group had significantly higher than the experimental group (p-value <0.001), (p-value =0.009), respectively. On the other hand, the energy

expenditure per day in control group was higher than experimental group (p-value = 0.035). However, the trend of change in experimental group was better than control group as line graph (Figure 4-9).

Therefore, all activities in obesity control program helped to improve these variables and reduce the number of obese students in school.

6.2 Lessons Learned

These lessons are presented as below:

6.2.1 Lessons learned from the research methodology

This study includes the collection of both quantitative and qualitative data. Mixed methods by using the embedded experimental research design are useful to identify the best of obesity control program in students. The qualitative method started in phase I. The qualitative method utilized in-depth interviews in school directors, teachers, and food cookers and focus group discussions to confirm and support the contents of participants in school. In phase II, the result from DLHPS would combine between literature review and participants in experimental school. The quantitative method was used in phase III for testing and development the program for appropriation obesity control program in school. This program would test by comparison with control school. Lessons learned from the research methodology were the researcher could perform the study process according to objective of this study. Although, the long period of time for conduction was 10 months in this study, the researcher could accomplish in the results according to the objective. The collaboration of participants was the key success factor of study.

6.2.2 Lessons learned from participants in experimental school

All participants in experimental groups could participate with obesity control program from start to finish the program. The participation of all parties could collaborate in obesity control program by accomplishment according to the responsibility as follows:

6.2.2.1 School director:

School director was the main person for collaboration among teachers. He connected the responsible teachers for cooperation and he followed all activities in program. He was the leader for bring the healthy program and policy to school. He knew about the benefit of the obesity control project. This finding depicted that school director was the leader for health promotion. They brought the healthy project from policy to practice in school.

6.2.2.2 Teachers:

Teachers were the important person for receiving the healthy activities and policy from school director to school. They could transfer the policy to implementation. Teachers in school participated with researcher and team all the project such as teacher meeting, the healthy day/healthy activity in school, morning exercise in school, and integrated the obesity control contents in all subjects. All teachers could adjust their knowledge and skill about creative worksheet for obesity control program in school. The important thing for mission accomplishment was the cooperation in healthy program by willingness.

6.2.2.3 Food cookers:

Food cooker was one person could release the overweight students in school. They were the person who food preparing and cooking. They should have the knowledge and skill for providing the healthy food for their students. Therefore, all food cookers had to receive the knowledge for healthy food preparing and cooking. Moreover, they should adjust the cafeteria environment for healthy food such as healthy and unhealthy food picture; the disadvantage of fat, sweet food; the advantage of fruits and vegetables. The portion size of food for students in each group age was the necessary for school lunch meal such as the students in elementary school students should have the quantity of food per meal as follows: rice 2.5 ladles, protein 2 table spoons, vegetables 4 table spoons, fruits 1portion.

6.2.2.4 Parents:

Parents were person who cares about students when they stay at home. The knowledge, awareness, skill, and conviction of parents should receive from nutrition education, newsletter, and home visit because the useful information help to increase their knowledge of obesity control in children. Parents could know the

danger of obesity in children and concern with healthy food and exercise in their home. The important thing, they could follow up the nutritional status of their children from obesity to overweight and overweight to normal weight status in their children.

6.2.2.5 Students:

Students were the target for obesity control. Participation of students was the necessary thing for moving the obesity control program. Therefore, the pattern of all activities had to perform by appropriation with children such as game, drawing and painting picture, work shop, and singing. They could enjoy in all activities. Moreover, students had the enhancement of obesity prevention skill and the awareness of obesity prevention. The cooperation of all parties could support the students for action in activities.

6.2.3 Lessons learned from conducting program and development

The main of obesity control program activity was applied by DLHPS and previous studies in literature review. The participants in experimental school helped to adjust the activity before the intervention starting. Most obesity control activity intervened in students that were nutrition education, healthy food activity, and exercise in the morning. The coordinator was health teacher who helped to appoint, connect, communicate, and encourage students in the healthy program. Representative teacher in each subject supported with program for integration the obesity control contents in subject. Worksheet were created and distributed to all students for knowledge and skill building in obesity prevention.

Communication between researcher and parents was newsletters, meeting, and home visit. Newsletter was sent by students. The contents in newsletter combined with the objective and activity in obesity control program, situation of obese children, obesity prevention in children, the news and progression of obesity control program, and the picture of activity. Moreover, home visit in obese students was the extra activity that was set by researcher. Three parents of obese students were visited after students could not progress after program participation. Knowledge document, brochure, and poster about food quantity of students per day and meal were distributed to parents. The problem of student who could not reduce their weight was revealed from parents. Most barriers included frequency of meal per day, type of food, snack,

and beverage consumption. Students known about the obesity control method that researcher and teachers taught them but they could not change their behavior. Parenting, caring, and environment were the obesity factor in children.

Food cookers were the person who prepared the school lunch to students. Nutrition education was the activity for sharing, discussion, and knowledge changing between researcher and food cookers. School lunch meal, food, snack, and beverage were adjusted for healthy food in school. The healthy corner was created by researcher and students. Students could answer the healthy question and receive the award from this activity.

All activities from all parties helped to move the program to successful obesity control program in school. This healthy program helped to awareness increasing in all participants who created the other healthy projects in school. This participation and coordination was key factors for successful research and development process in the future.

6.2.4 Lessons learned for the researcher's self development

The process of this study helped to teach the researcher valuable lessons. The coordinate of all resource that were school director, teachers, food cookers, students and parents supported researcher to solve the barriers and bring to accomplishment of study goals. All of study process taught the researcher about knowledge and skills for doing the research in school and community. Moreover, the connection among school, health care service, local government, and researcher helped to improve the other healthy activities in school and community in the next time.

6.3 Limitations

6.3.1 This study was based on embedded experimental research design; Mixed methods. The knowledge of this study especially in phase I was analyzed from the obesity control program of DLHPS and previous studies. Therefore, the limitation of application was most activities could apply in other schools but some activity might

not be able to be generalized because of the different context of school such as the environment of school, teamwork, and policy of school.

6.3.2 This study use the 3 times for collecting and analyze the data that was before program intervention (Time 1), during program intervention (Time 2), and immediately after program intervention (Time 3). However, collecting and analyze the data after program intervention for one month was the interesting period that assessed the efficiency of obesity control program. This time could not available collecting data because students finished the study in the second semester and close the school. Therefore, the outcomes and outputs of obesity control program in this study might not sustain in school.

6.4 Disadvantage

6.4.1 This study did not bring the obesity control program from all DLHPSs. Therefore, this program might not be performed in general schools and used in all activities of program. This study should be developed for finding the new activities to support in general schools.

6.4.2 From this study had not been the participation of community and health care service. Therefore, the obesity control program could be no sustainable program. This study should emphasize having the community and health care service involved in planning, performing, and monitoring in the program.

6.4.3 A long-term implementation should be conducted in this program because the nutritional status of student had to follow-up in long period. For this study, implementation period was 6 months only by researcher. After finish the program, this school might not be continued in this program. Therefore, the responsible person such as school health teacher had to continue this program in their school.

6.5 Recommendations

6.5.1 Policy level

The school directors were the key person for development the health promoting school because they had the power for strategic management. School director should support the healthy policy from Ministry of Education and Ministry of Public Health to school and distribute the responsibility to teachers. The healthy policy should be established in school such as health curriculum, nutrition education in all subjects, and healthy cafeteria in school.

Moreover, the activity of obesity in DLHPS should be promoted to other schools by create manual of obesity control program in school. The integrating the content of the controlling obesity in students was one strategy for implementation that should be supported in long term. School health nurses are person to create health promotion in school. They could cooperate with school health teacher and health care service for applying the obesity control guideline in all groups such as students, parents, teachers, and food cookers.

6.5.2 School level

The school director, teachers, food cookers, and students should collaborate with in school for conduct the obesity control activity in school. The school director should establish the controlling obesity policy in school and create the school to health promoting school. Teachers should be the role model to healthy person for their students including the food cookers should support the healthy food preparing and cooking for their children. Students should receive the health education for enhance their skill for controlling obesity. This could achieve goal of controlling obesity and increase long term sustainable.

6.5.3 Family level

The parenting of parents was an obesity cause in children. They should adjust their thinking that obese children were cute children, but they should concern the disadvantage of obesity in children. Therefore, they have to establish the healthy

life to their children. Parental role model is necessary for controlling diet consumption in children. The healthy food consumption and exercise behavior of parents should implement in the children. Parents have to bring the healthy such as fruits/vegetables and ban the unhealthy food such as snack, soft drink, and fat food into their home. Healthy activities in family have to occur for relationship building and healthy support among members such as vegetables planting, sport, housework, and travel trip. TV watching and VDO game playing have to limit the time for children. However, information about obesity control for parents is one strategy for problem solving in their children.

6.5.4 Community level

Local government and health care service should support to establish healthy shop and playground in community around the student's home. The healthy place in community helps to reduce the obese children in community. All populations in community have to control the number of obese children because children in community are the human resource who is the healthy adulthood in the future. These healthy adult will develop their community to healthy young generation.

6.6 Future Research

6.6.1 The future study of the obesity control program should collect the data in after program intervention for one month to confirm the outcomes and outputs from the program.

6.6.2 The next obesity control program should focus on parental involvement and add more new activities for parental participation at school and their home for obesity control activities development and increasing sustainability.

6.6.3 This study should be enhanced the sustaining network for obesity controlling. Local administrators, shopkeepers around schools, and other organizations were cooperated of program to promote the sustainability of obesity control program. This program had the benefit for all schools especially school health teachers and public health nurses. Therefore, the manual developed in this obesity control program

should be distributed and used in school. Moreover, intensive workshop should be provided to the teachers to control obesity in students and foster network development.

6.6.4 The effect of obesity control program should be investigated in long term for participation of all parties. Monitoring of obesity control program should be performed for sustainability of program.

REFERENCES

Abraham, M., Robert, K., & Kim, J. (2002). *Rudolph's fundamentals of Pediatrics*. (3rd ed). USA. The McGraw-Hill Companies, Inc.,12-16.

Aekplakorn, W., Chaiyapong, Y., Neal, B., Chariyalertsak, S., Kunanusont, C., Phoolcharoen, W., & Suriyawongpaisal, P. (2004). Prevalence and Determinants of Overweight and Obesity in Thai Adults: Results of the Second National Health Examination Survey. *Journal of Medical Association of Thailand, 87(6),* 685-693.

Aekplakorn, W., & Mo-Suwan, L. (2009). Prevalence of obesity in Thailand. *Obesity reviews,10,* 589–592.

Ahmed, M., Ong, K., & Dunger, D. (2009).Childhood obesity and the timing of puberty. *Endocrinology and Metabolism, 20(5),* 237-242.

American Academy of Pediatrics. (2003). Prevention of pediatric overweight and obesity. *Pediatrics, 112*, 424-430.

American Diabetes Association. (2006). Clinical Practice Recommendations 2006, *Diabetes Care*, 29(1).

Anderson, R., & Sabiston, C. (2010). Physical Activity for obese Children and Adults. In Dube, L., Bechara, A., Dagher, A., Drewnowski, A., Lebal, J., James, P., & Yada, RY. (Eds.), *Obesity Prevention; The role of brain and society on individual behavior* (pp.393). San Diego, CA: Elsevier.

Angelopoulos, P., Milionis, H., Grammatikaki, E., Moschonis, G.,& Manios, Y. (2009). Changes in BMI and blood pressure after a school based intervention: The children study. *European Journal of Public Health, 19(3),* 319–325.

Arsenult, B.J., Rana, J.S., Lemieux, I., Despres, J-P., Kastelein, J.J.P., Boekholdt, S.M., Wareham, N.J., & Khaw, K-T. (2010). Physical inactivity, abdominal obesity and risk of coronary heart disease in apparently healthy men and women. *International Journal of Obesity, 34,* 340-347.

Baak, A. (2010). *Exercise, Physical Activity and obesity. Clinical obesity in Adults and Children.* (3rd ed.). Blackwell Publishing. USA. 313-326.

Banchonhattakit, P. (2008). *Effects of school-social network on childhood obesity prevention (SNOCOP) in primary school, Saraburi province.* A thesis submitted in partial fulfillment of the requirements for the Degree of Master of Science (Public Health), Faculty of Graduate Studies, Mahidol University.

Baratta, R., Degano, C., Leonardi, D., Vigneri, R., & Frittitta, L. (2006). High prevalence of overweight and obesity in 11e15-year-old children from Sicily.Nutrition, *Metabolism & Cardiovascular Diseases, 16*, 249-255.

Barsh, GS., Farooqi, IS., & O'Rahilly,S. (2000). Genetics of body-weight regulation. *Nature, 404*, 644-651.

Baumrind, D. (1973). The development of instrumental competence through socialization. In A.D. Pick (Ed.), *Minnesota symposium on child psychology* (Vol. 7, pp.3-46). Minneapolis: University of Minnesota Press.

Baumrind, D. (1991). The influence of parenting style on adolescent competence and substance use. *Journal of early Adolescence, 11*, 56-95.

Bayer, O., Kries, R., Strauss, A., Mitschek, C., Toschke, M., Hose, A., et al. (2009). Short- and mid-term effects of a setting based prevention program to reduce obesity risk factors in children: A cluster-randomized trial. *Clinical Nutrition, 28*, 122–128.

Bee, H., & Boyd, D. (2007). *The developing child.* (11th ed.). Pearson Education, Inc. USA. p 411.

Benner, A., Al-Mahdi, H., Ali, A., Al-Nufal, M., Vachhani, P., & Tewfik, I. (2011).Obesity and low vision as a result of excessive Internet use an television viewing. *International Journal of Food Sciences and Nutrition, 62(1),* 60–62.

Bere, E., Hilsen, M., & Klepp K-I. (2010). Effect of the nationwide free school fruit scheme in Norway. *British Journal of Nutrition, 104*, 589-594.

Beth Yano, k., Ebesutani, J., Lu, C., & Choy, D. (2009). *Practical Guidelines for Childhood Obesity Interventions. Child Psychology Service, Department of Psychology.* Honolulu, HL: Springer.

Birch, L., & Davison, K. (2001). Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight. *Pediatric Clinic of North American, 48(4),* 893-907.

Boon, C.S., & Clydesdale, F.M. (2005). A review of childhood and adolescent obesity interventions. *Critical Review in Food Science and Nutrition, 45,* 511–525.

Bouchard, C., Tremblay, A., Leblanc, C., Lortie, G., Savard, R., & Theriault, G. (1983). A method to assess energy expenditure in children in children and adults. *American Journal Clinical of Nutrition. 37,* 461-467.

Boumtje, P.I., Huang, C.L., Lee, J-Y., & Lin, B-H. (2005). Dietary habits,demographics, and the development of overweight and obesity among children in the United States. *Food Policy, 30,* 115–128.

Brambilla, P., Bedogni, G., & Moreno, L. (2006) Cross-validation of anthropometry against magnetic resonance imaging for the assessment of visceral and subcutaneous adipose tissue in children. *International Journal of Obesity and Related Metabolic Disorders, 30,* 23-30.

Brook ,R.H., Ware, J.E., Davies-Avery, A., Stewart, A.L., Donald, C.A., Rogers, W.H., et al. (1979). Overview of adult health status measures fielded in Rand's health insurance study. *Medical Care,17(7),* 1-131. (Supplement).

Brown, R., & Ogden, J. (2004). Children's eating attitudes and behavior: a study of the modeling and control theories of parental influence. *Health Education Research, (3),* 261-271.

Brownson, R., Chriqui, J., Burgeson, C., Fisher, M., & Ness, R. (2010). Translating Epidemiology Into Policy to Prevent Childhood Obesity: The Case for Promoting Physical Activity in School Settings. *Annals of Epidemioogyl, 20,* 436–444.

Bureau of Policy and Strategy. (2011). *Thailand Health Profile 2008-2010.* The war veterans organization of Thailand, Thailand : Ministry of Public health.

Caballero,B., Clay, T., Davis, S.M., Ethelbah, B., Rock, B.H., Lohman, T., et al. (2003). Pathways: a school-based, randomized controlled trial for the prevention of obesity in American Indian schoolchildren1–3 Benjamin, *American Journal Clinical of Nutrition, 78,*1030–1038.

Campagnolo, P.D.B., Vitolo, M.R., Gama, C.M., & Stein, A.T. (2008). Prevalence of overweight and associated factors in southern Brazilian adolescents. *Public Health, 122,* 509–515.

Caspersen, C.J., Powell, K.E, & Christenson, G.M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports, 100(2),* 126-130.

Chen, B., & Li, H.F. (2011). Waist circumference as an indicator of high blood pressure in preschool obese children. *Asia Pacific Journal of Clinical Nutrition, 20 (4),* 557-62.

Chin A Paw, M.J.M., Singh, A.S., Brug, J., & Mechelen, W.V. (2008). Why did soft drink consumption decrease but screen time not? Mediating mechanisms in a school-based obesity prevention program. *International Journal of Behavioral Nutrition and Physical Activity, 5(41),* 1-11.

Chokprajakchad, M. (2009). *The effectiveness of a weight management program using the camp technique for obese school children.* A thesis submitted in partial fulfillment of the requirements for the Degree of Master of Science (Nutrition), Faculty of Graduate Studies, Mahidol University.

Chrzanowska, M., & Ulijaszek, S. (2007). Changes in BMI and the prevalence of overweight and obesity in children and adolescents in Cracow, Poland, 1971–2000. *Economics and Human Biology, 5,* 370–378.

Clifton, P.M., Chan, L., Moss, C.L., Miller, M.D., &Cobiac, L. (2011). Beverage intake and obesity in Australian children. *Nutrition & Metabolism, 8,* 87, 1-11.

Colles, S.L., Dixon, J.B., & O'Brien, P.E. (2008). Hunger control and regular physical activity facilitate weight loss after laparoscopic adjustable gastric banding, *Obesity Surgery, 18(7),* 833-840.

Crawford, D., Cleland, V., Timperio, A., Salmon, J., Andrianopoulos, N., Roberts, R., et al. (2010). The longitudinal influence of home and neighborhood environments on children's body mass index and physical activity over 5 years: the CLAN study. *International Journal of Obesity, 34,* 1177-1187.

Creswell, A. (1980). *School health practice.* (7th ed). U.S.A., Mosby.

Creswell, J.W., & Clark, V.L. (2007). Designing and Conducting Mixed Methods Research. Thousand Oaks, Sage Publications Inc.

Creswell, J. W., Plano Clark, V. L., Gutmann, M., & Hanson, W. (2003). Advanced mixed methods research designs. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 209–240).

DeMattia, L., & Denney, S.L., (2008). Childhood obesity prevention: Successful communitybasedefforts. *Annals of the American Academy of Political and Social Science, 615,* 83–99.

DeMattia, L., Lemont, L., & Meurer, L. (2012). Do interventions to limit sedentary behaviours change behaviour and reduce childhood obesity? A critical review of the literature. *Obesity reviews, 8*, 69–81.

Dennison, B., & Edmunds, L. (2008). The role of television in childhood obesity. *Progress in Pediatric Cardiology, 25,* 191–197.

Denova-Gutierrez, E., Talavera, J.O., Flores, M., Macı´as, N., Rodrı´guez-Ramı´rez, S., Flores, YN., et al. (2011). Dietary Patterns Are Associated with Different Indexes of Adiposity and Obesity in an Urban Mexican Population. *The Journal of Nutrition, 141,* 921–927.

Department of Education,Training and Youth Affairs. (1998) *National school drug education strategy: a national action plan under the national drug strategic framework 1998-99 to 2002-03* (draft public discussion paper) Department of Education,Training and Youth Affairs, Canberra.

Department of Health. (1992). *The Health of Nation: A Strategy for Health in England Cm 1986*. London: HMSO.

Department of Health, Ministry of Public Health. (2005). *Promoting Schools Health Promoting standards (revised)*. Nontaburi, Thailand: Agricultural Cooperative Federation of Thailand, Department of Health, Ministry of Public Health.

Department of Public health strategy development. (2011). *Health status of Population in Nakhornnayok province and The result of implementation year 2011*. Nakhornnayok, Thailand: Department of Public health strategy development, Bureau of Public health Nakhornnayok province.

Devision of Sport Science, Sports Authority of Thailand. (2011). Physical fitness test. Bangkok. *Retrieved December 1, 2011, from* http://sportscience.sat.or.th/utility.*aspx.*

Dezenberg, C.V, Nagy, T.R, Gower, B.A, Johnson, R., Goran, M.I. (1999). Predicting body composition from anthropometry in pre-adolescent children. *International Journal of Obesity and Related Metabolic Disord*ers, *23,* 253–259.

Din-Dzietham, R., Liu, Y., Bielo, M.V., & Shamsa, F. (2007). High blood pressure trends in children and adolescents in national surveys 1963–2002. *Circulation, 116,* 1488–1496.

Doak, C.M., Visscher, T.L., Renders, C.M., & Seidell, J.C. (2006). The prevention of overweight and obesity in children and adolescents: a review of interventions and programs. *Obesity reviews, 7,* 111–136

Donnelly, J. E., Greene, J.L., Gibson, C.A., Smith, B.K., Wadhburn, R.A., Jacobsen, D.J., et al. (2009). Physical Activity Across the Curriculum (PAAC): A randomized controlled trial to promote physical activity and diminish overweight and obesity in elementary school children. *Preventive Medicine, 49,* 336–341.

Driskell, M-M., Dyment, S., Mauriello, L., Castle,P., & Sherman, K. (2008). Relationships among multiple behaviors for childhood and adolescent obesity prevention. *Preventive Medicine, 46,* 209–215.

Ebbeling, C.B., Pawlak, D.B., & Ludwig, D.S. (2002). Childhood obesity: public-health crisis, common sense cure. *Lancet, 360,* 473-482.

Eisenmann, J.C., Gentile, D.A., Welk, G.J., Callahan, R., Strickland, S., & Walsh, M. et al. (2008). SWITCH: rationale, design, and implementation of community, school, and family-based intervention to modify behaviors related to childhood obesity. *BMC Public Health, 8,* 223-230.

Eneli, I., Cunningham, A., & Woolford, S.J. (2008). The pediatric multidisciplinary obesity program: An update. *Progress in Pediatric Cardiology, 25,*129–136.

Epstein, L., & Goldfield, G. (1999). Physical activity in the treatment of childhood overweight and obesity: current evidence and research issues. *Medicine & Science in Sports and Exercise, 31,* S553-S559.

Faith, M., Berkowitz, R., & Stallings, V. (2004). Parental feeding attitudes and styles and child body mass index: Prospective analysis of a gene-environment interaction. *Pediatrics, 114(4),* 429-436.

Farajian, P., Renti, E., & Manios, Y. (2008). Obesity indices in relation to cardiovascular disease risk factors among young adult female students. *British Journal of Nutrition, 99,* 918–924.

Favaro, A., & Santonastaso, P. (1995). Effects of parents of parents' psychological characteristics and eating behavior on childhood obesity compliance. *Journal of Prychmomotrc Kworch., 39(2),* 145-151.

Fisher, j., & Birch, L. (2002). Eating in the absence of hunger and overweight in girls from 5 to 7 Y of age. *American Journal of Clinical Nutrition, 76,* 226-231.

Fitch, A., & Bock, J. (2009). Effective dietary therapies for pediatric obesity treatment. *Reviews in Endocrine & Metabolic Disorders, 10,* 231–236.

Flattum, C., Friend, S., Neumark-Sztainer, D., & Story, M. (2009). Motivational Interviewing as a Component of a School-Based Obesity Prevention Program for Adolescent Girls. *Journal of the American dietetic association, 109(1),* 91-94.

Forslund, H.B., Torgerson, J.S., Sjöström, L., & Lindroos, A.K. (2005). Snacking frequency in relation to energy intake and food choices in obese men and women compared to a reference population. *International Journal of Obesity, 29,* 711–719.

Forum on Child and Family Statistics. (2005). America's children: Key national indicators of well-being 2005. Retrieved January 11, 2006, from http://www. childstats.gov/americaschildren/hea3.asp.

Fritsch, K. (2007). Working Together: Health Promoting Schools and School Nurses. *Asian Nursing Research, 1(3),* 147-152.

Fu, W., Lee, H., & Ng, C. (2003). Screening for childhood obesity: international & population specific definitions. Which is more appropriate? *International Journal of Obesity, 27,* 1121-1126.

Gahagan, S. (2004). Child and adolescent obesity. *Curr Probl Pediatr Adolesc Health Care, 1,* 6-43.

Garasky, S., Stewart, S., Gundersen, C., Lohman, B., & Eisenmann, J. (2009). Family stressors and child obesity.*Social Science Research, 38,* 755–766.

Garaulet, M., Ortega, F.B, Ruiz, J.R., Rey-Lopez, J.P., Beghin, L., Kafatos, A., et, al. (2011). Short sleep duration is associated with increased obesity markers in European adolescents: effect of physical activity and dietary habits. The HELENA study. *International Journal of Obesity, 35,* 1308–1317.

Gerrior, S., Juan, W.Y., & Peter, B. (2006). An Easy Approach to Calculating Estimated Energy Requirements. *Preventing Chronic Disease,3(4),* A129.

Gibbs, Anita (1997), 'Focus Groups', *Social Research Update*, Issue 19 Winter 1997, Department of Sociology, University of Surrey, England. Available at http://sru.soc.surrey.ac.uk/SRU19.ht

Gillis, L.J. & Bar-Or, O. (2003). Food Away from Home, Sugar-Sweetened Drink Consumption and Juvenile Obesity. *Journal of the American College of Nutrition, 22(6),* 539–545.

Glasgow, K.L., dornbusch, S.M., royer, L., steinberg, L., & Ritter, P.L. (1997). Parenting styles, adolescents's attributions, and educational outcomes in nine heterogeneous high schools. *Child Development, 68,* 507-529.

Gleason, P.M., & Dodd, A.H. (2009) School Breakfast Program but Not School Lunch Program Participation Is Associated with Lower Body Mass Index. *Supplement to the Journal of the American Dietetic Association, 109,* S118-S128.

Gonzalez-Suarez, C., Worley, A., Grimmer-Somers, K., & Dones, V. (2009). School-Based Interventions on Childhood Obesity A Meta-Analysis. *American Journal of Preventive Medicine, 37(5),* 418-427.

Goran, M.I., Gower, B.A., Treuth, M., & Nagy, T.R. (1998). Prediction of intra-abdominal and subcutaneous abdominal adipose tissue in healthy pre-pubertal children. *International Journal of Obesity, 22,* 549–558.

Gorely, T., Morris, J.G., Musson, H., Brown, S., Nevill, A., & Nevill, M.E. (2011). Physical activity and body composition outcomes of the GreatFun2Run intervention at 20 month follow-up. *International Journal of Behavioral Nutrition and Physical Activity, 8,(74),* 1-11.

Greene, J.C., Caracelli, V.J., & Graham, W.F., (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis, 11(3),* 255–274.

Greenfield, A., & Marks, N. (2009). Violence from parents in childhood and obesity in adulthood: Using food in response to stress as a mediator of risk. *Social Science & Medicine, 68,* 791–798.

Greening, L., Harrell, K.T., Low, A.K., & Fielder, C.E. (2011). Efficacy of a School-Based Childhood Obesity Intervention Program in a Rural Southern. *Obesity, 19,* 1213–1219.

Gronbaek, H.N., Madsen, S.A., & Michaelsen, K.F. (2009). Family involvement in the treatment of childhood obesity: the Copenhagen approach. *European Journal of Pediatrics, 168,* 1437–1447.

Gross, S., Pollock, E., & Braun, B. (2010). Family Influence: Key to Fruit and Vegetable Consumption among Fourth- and Fifth-grade Students. *Journal of Nutrition Education and Behavior, 42,* 235-241.

Guyer, B., Ma, S., Grason, H., Frick, K., Perry, D.,& Sharkey, A. (2009). Early Childhood Health Promotion and Its Life Course Health Consequences. *Academic Pediatrics, 9,* 142–149.

Haire-Joshu, D., Elliott, M.B., Caito, N.M., Hessler, K., Nanney, M.S., Hale, N., et al. (2008). High 5 for Kids: The impact of a home visiting program on fruit and vegetable intake of parents and their preschool children. *Preventive Medicine, 47,* 77-82.

Harris, K., Kuramoto, L., Schulzer, M., & Retallack, J. (2009). Effect of school-based physical activity interventions on body mass index in children: a meta-analysis. *Canadian Medical Association journal, 180(7),* 719-726.

Harter, S. (1999). *Developmental approaches to self processes*. New York: Guilford.

Hassink, S.G. , Zapalla, F. , Falini, L., & Datto, G. (2008). Exercise and the obese child. *Progress in Pediatric Cardiology, 25,* 153-157.

Hedley, A., Ogden, C., Johnson, C., Carroll, M., Curtin, L., & Flegal, K. (2004). Prevalence of Overweight and Obesity among US Children, Adolescents, and Adults, 1999-2002. *Journal of the American Medical Association, 291(23),* 2847-2850.

Herrera, B.M., Keildson, S., & Lindgren, C.M. (2011). Genetics and epigenetic of obesity. *Maturitas, 69,* 41–49.

Hill, J.O., & Wyatt, H.R. (2005). Role of physical activity in preventing and treating obesity. *Journal of Applied Physiology, 99,* 765-770.

Himes, J.H. (2006). Changes of accurately measuring and using BMI and other indicators of obesity in children. *Pediatrics, 124,* Suppl. 1, S3-S22.

Hirsch, F.G. (1990). *Development dilemmas in rural Thailand.* Oxford: Oxford University Press.

Hollar, D., Messian, S., Lopez-Mitnik, G., Hollar, L., & Almon, M. (2010). Effect of a Two-Year Obesity Prevention Intervention on Percentile Changes in Body Mass Index and Academic Performance in Low-Income Elementary School Children. *American Journal of Public Health, 100(4),* 646-652.

Holsten, J.E. (2008). Obesity and the community food environment: a systematic Review. *Public Health Nutrition, 12(3),* 397–405.

Howard, K.R. (2007). Childhood Overweight: Parental Perceptions and Readiness for Change. *The Journal of School Nursing, 23,* 73-79.

Huang, J.S., Donohue, M., Becerra, K., & Xu, R. (2009). Relationship between Parents' and Children's Weight Perceptions Results of a Survey. *ICAN: Infant, Child, & Adolescent Nutrition, 1(15),* 14-20.

Huberty, J., Balluff, M., O'Dell, M., & Peterson, K. (2010). From good ideas to actions: A model-driven community collaborative to prevent childhood obesity. *Preventive Medicine, 50,* S36–S43.

Hwang, M-J., Chung, W-S., Gallagher, D., Kim, D-Y., Shin, H-D., & Song M-Y. (2008). How useful is waist circumference for assessment of abdominal obesity in Korean pre-menopausal women during weight loss? *Asia Pacific Journal of Clinical Nutrition, 17(2),* 229-234.

Ickes, M.J., & Sharma,M. (2011). A review of childhood obesity prevention interventions targeting African American children. *Vulnerable Children and Youth Studies, 6(2),* 103-123.

James, J., Thomas, P., Cavan, D., & Kerr, D. (2004). Preventing childhood obesity by reducing consumption of carbonated drinks: cluster randomized controlled trial. *British Medical Journal, 328,* 1237-1245.

Janssen, I. (2009). Influence of age on the relation between waist circumference and cardiometabolic risk markers. *Nutrition, Metabolism & Cardiovascular Diseases, 19,* 163-169.

Jensen, G.L., & Ying Hsiao, P. (2010). Obesity in older adults: relationship to functional limitation. *Clinical Nutrition and Metabolic Care, 13,* 46–51.

Jiang, J., Xia, X., Greiner, T., Wu, G, Lian, G., & Rosenqvist, U. (2007). The effects of a 3-year obesity intervention in school children in Beijing. *Child Care Health and Development, 33,* 641–646.

Jimenez-Cruz, A., Bacardi-Gascon, M., Jones, E. (2002). Consumption of Fruits, Vegetables, Soft Drinks, and High-Fat-Containing Snacks Among Mexican Children on the Mexico-U.S. Border. *Archives of Medical Research, 33,* 74–80.

Jose, L. & Loise, G. (2006). Obesity Prevention in Pediatrics: A Pilot Pediatric Resident Curriculum Intervention on Nutrition and Obesity Education and Counseling. *Journal of the national medical association, 98(9),* 1483-1488.

Jouret, B., Ahluwalia, N., Dupuy, M., Cristini, C., Negre-Pages, L., Grandjean, H., et al. (2010). Prevention of overweight in preschool children: results of kindergarten-based interventions. *International Journal of Obesity, 33,* 1075-1083.

Kaewsup, W. (2008). *Effect of Aerobic Exercise Intensity at 60-75% MHR on Phycical Fitness in Obese Children.* A thesis submitted in partial fulfillment of the requirements for the Degree of Master of Science (Sport Science), Faculty of Graduate Studies, Chang Mai University.

Kang, H., Ryu, M-H., & Park, S. (2008). The Effects of a Weight Loss Program Focusing on Maternal Education on Childhood Obesity. *Asian Nursing Research, 2(3),* 150-158.

Karasu, S.R., & Karasu., T.B. (2010). *The Gravity of weight A clinical guide to weight loss and maintenance.* Arlington,VA: American psychiatric Publishing.

Kato, M., Takahashi, Y., Inoue, M., Tsugane, S., Kadowaki, T., & Noda, M. (2008). Comparisons between anthropometric indices for predicting the metabolic syndrome in Japanese. *Asia Pacific Journal of Clinical Nutrition, 17(2),* 223-238.

Keast, D.R., Nicklas,T.A., & O'Neil, C.E. (2010). Snacking is associated with reduced risk of overweight and reduced abdominal obesity in adolescents: National Health and Nutrition Examination Survey (NHANES) 1999–2004. *The American Journal of Clinical Nutrition, 92,* 428–435.

Kerddornphake, P., & Tharakul, S. (2011). The situation in School Health Practice in Thailand. *Journal of Public Health Nursing, 25(1),* 115-141.

Keller, S.K., & Schulz, P.J. (2010). Distorted food pyramid in kids programmes: A content analysis of television advertising watched in Switzerland. *European Journal of Public Health, 21(3),* 300–305.

Ketel, I., Volman, M., & Seidell, J. (2007). Superiority or skinfold measurements and waist over waist-to-hip ratio for determination of body fat distribution in a population-based cohort of Caucasian Dutch adults. *European Journal of Endocrinology, 156,* 655-661.

Khasnutdinova, S.L., & Grjibovski, A.M. (2010). Prevalence of stunting, underweight, overweight and obesity in adolescents in Velsk district, north-west Russia: A cross-sectional study using both international and Russian growth references. *Public health, 124,* 392-397.

Kipke, M., Iverson,E., Moore, D., Booker, C., Ruelas, V., Peters, A., et al. (2007). Food and Park Environments: Neighborhood-level Risks for Childhood Obesity in East Los Angeles. *Journal of Adolescent Health, 40,* 325–333.

Kohler, M., & Heuvel, C. (2008). Is there a clear link between overweight/obesity and sleep disordered breathing in children? *Sleep Medicine Reviews, 12,* 347-361.

Kopelman, P., Caterson, I., & Dietz, W. (2010). *Clinical Obesity in adult and children.*(3rd ed.). Wiley-Blackwell, Singapore. 375-377.

Kosulwat, V. (2002). The nutrition and health transition in Thailand. *Public Health Nutrition, 5(1A),* 183–189.

Krebs, N., Himes, J., & Jacobson, D. (2007). Assessment of child and adolescent overweight and obesity. *Pediatrics, 120(4),* S193-S228.

Kriemler, S., Puder, J., Zahner, L., Roth, R., Meyer, U., & Bedogni, G. (2010). Estimation of percentage body fat in 6-to 13-year-old children by skinfold thickness, body mass index and waist circumference. *British Journal of Nutrition, 104,* 1565-1572.

Krueger, R.A., & Casey, M.A. (2000). *Focus Groups: A Practical Guide for Applied Research.* 3rd ed. Thousand Oaks, CA: Sage.

Kubik, M., Story, M., & Davey, C. (2007). Obesity prevention in schools: Current role and future practice of school nurses. *Preventive Medicine, 44,* 504–507.

Labayen, I., Ruiz, J.R., Ortega, F.B., Harro, J., Merena, L., Veidebaum, T., & Sjostrom, M. (2011). Insulin sensitivity at childhood predicts changes in total and central adiposity over a 6-year period. *International Journal of Obesity, 35,* 1284–1288.

Langendijk, G., Wellings, S., Wyk, M., Thompson, S., McComb, J., & Chusilp, K. (2003). The prevalence of childhood obesity in primary school children in urban Khon Kaen, Northeast Thailand. *Asia Pacific of Journal Clinical Nutrition, 12 (1),* 66-72.

Latner, J., Rosewall, J., & Simmonds, M. (2007). Childhood obesity stigma: Association with television, videogame, and magazine exposure. *Body Image, 4,* 147–155.

Lee, S-K. (2010). Should waist circumference be used to identify metabolic disorders than BMI in South Korea? *European Journal of Clinal Nutritin, 64,* 1373-1376.

Lehto, R., Ray, C., Lahti-Koski, M., & Roos, E. (2011). Health behaviors, waist circumference and waist-to-height ratio in children. *European Journal of Clinical Nutrition, 65,* 841–848.

Levitt, M., Guacci-Franco, N., & Levitt, J. (1993). Convoys of social support in Childhood and Early Adolescence: struction. *Developmental Psychology, 29,* 815.

Likitmaskul, S. (2002). Problem of childhood obesity in Thailand. *Clinical Journal,12,* 1009-1016.

Limbers, C., Turner, E., & Varni, J. (2008).Promoting healthy lifestyles: Behavior modification and motivational interviewing in the treatment of childhood obesity, *Journal of Clinical Lipidology*, *2,* 169–178.

Lincoln, Y.S., & Guba, E.G. (1985). *Naturalistic Inquiry.* Beverly Hills. CA: Sage Publications.

Liu, A., Abbasi, F., & Reaven, G.M. (2011). Adiposity indices in the prediction of metabolic abnormalities associated with cardiovascular disease in non-diabetic adults. *Nutrition, Metabolism and Cardiovascular Diseases, 21,* 553-560.

Lloyd, L., Langley-Evans, S., & McMullen, S. (2010). Childhood obesity and adult cardiovascular disease risk: a systematic review. *International Journal of Obesity, 34,* 18-28.

Lohman, T., & Chen, Z. (2005). Dual-energy X-ray absorptiometry. In: Heymsfield ,S., Lohman, T., Wang, Z., Going, S. Human Body Composition, 2nd .Windsor, ON: Human Kinetics.

London, R., & Gurantz, O. (2013). Afterschool Program Participation, Youth Physical Fitness, and Overweight. *American Journal of Preventive Medicine, 44(3S3),* S200 –S207.

Lorch, S.M, & Sharkey, A. (2007). Myocardial velocity, strain, and strain rate abnormalities in healthy obese children. *Journal of the Cardiometabolic Syndrome, 2,* 30–34.

Lowry, R., Wechskler, H., Galuska, D.A., Fulton, J.E, & Kann, L. (2002). Television viewing and its associations with overweight, sedentary lifestyle, and insufficient consumption of fruits and vegetables among US high school students: differences by race, ethnicity, and gender's. *Journal of School Health, 72(10),* 413-421.

Mack, R., Skurnick, B., Sterling-Jean, Y., Pedra-Nobre, M., & Bigg D. (2004). Fasting insulin levels as a measure of insulin resistance in American blacks. *The Journal of Applied Research, 4(1),* 90-94.

Maffeis, C., Grezzani, A., Pietrobelli, A., Provera, S., & Tato, L. (2001). Does waist circumference predict fat gain in children?. *International Journal of Obesity, 25,* 978-983.

Mager, U., & Nowak, P. (2012). Effects of student participation in decision making at school: A systematic review and synthesis of empirical research. *Educational Research Review, 7,* 38–61.

Magnus, A., Haby, M., Carter, R., & Swinburn, B. (2009). The cost-effectiveness of removing television advertising of hight-fat and/or high-sugar food and beverages to Australian children. *International Journal of obesity, 33,* 1094-1102.

Maier, I.B., Özel, Y., Wagnerberger, S., Bischoff, S.C., & Bergheim, I. (2013). Dietary pattern and leisure time activity of overweight and normal weight children in Germany: sex-specific differences. *Nutrition Journal, 12(14),* 1-8.

Malina, R.M. (1990). Physical growth and performance during the transitional years (9-16). In R. Montemaypor, G.R. Adams,& T.P. Gullotta (Eds.), *From childhood to adolescence: A transitional period?* (pp.41-62). Newbury Park, CA:Sage.

Mamun, A., Hayatbakhsh, M., O'Callaghan, M., Williams, G., & Najman, J. (2009). Early overweight and pubertal maturation pathways of association with young adults'overweight:a longitudinal study. *International Journal of obesity,33,* 14-20.

Manora, S., Powwattana, A., Thaingtham, W., & Chongsuwat, R. (2010). Nutrition Program for Caretakers of Obese Preschool children Bangkok Metropolis. *Journal of Public Health, 40(2),* 137-149.

Martin, D. editor. (1999). Bone Remodeling and its Disorders. n.p.: 228.

Martins, D., Maia, J., Seabra, A., Garganta, R., Lopes, V., Katzmarzyk, P., et al. (2010). Correlates of changes in BMI of children from the Azores islands. *International Journal of Obesity, 34,* 1487-1493.

Maynard, MJ., Baker,G., Rawlins, E., Anderson, A., & Harding, S. (2009). Developing obesity prevention interventions among minority ethnic children in schools and places of worship: The DEAL (Diet and Active Living) study. *BMC Public Health, 9*,1-11.

McCarthy, H. (2006). Body fat measurements in children as predictors for the metabolic syndrome: focus on waist circumference. *Proceedings of Nutrition Society, 65*, 385-392.

McClintock, M., & Herdt, G. (1996). Rethinking puberty: The development of sexual attraction. *Current Directions in psychological Science, 5(6),*181.

McVey, G., Tweed, S., & Blackmore, E. (2007). Healthy Schools-Healthy Kids: A controlled evaluation of a comprehensive universal eating disorder prevention program. *Body Image, 4*, 115–136.

Melen, E., Himes, B.E., Brehm, J.M, Boutaoui, N., Klandeman, B.J., Sylvia, J.S., et al. (2010) .Analyses of shared genetic factors between asthma and obesity in children. *Journal of Allergy and Clinical Immunology, 10*, 631-637.

Menke, A., Muntner, P., Wildman, R.P., Reynolds, K., & He, J. (2007). Measures of Adiposity and Cardiovascular Disease Risk Factors. *Obesity, 50(3),* 785-795.

Meyer, A.A., Kundt, G., Lenschow, U., Schuff-Werner, P., & Kienast, W. (2006). Improvement of early vascular changes and cardiovascular risk factors in obese children after a six-month exercise program. *Journal of the American College of Cardiology, 48(9),*1865-1870.

Mfum-Mensah, O. (2011). Education collaboration to promote school participation in northern Ghana: A case study of a complementary education program. *International Journal of Educational Development, 31,* 465–471.

Millar, L., Kremer, P., de Silva-Sanigorski, A., McCabe, M.P., Mavoa, H., Moodie, M., et al., (2011). Reduction in overweight and obesity from a 3-year community-based intervention in Australia: the 'It's Your Move!' project. *Obesity reviews, 12(2),* 20–28.

Miller, P., Moore, R.H., & Kral, T.V. (2011). Children's Daily Fruit and Vegetable Intake: Associations with Maternal Intake and Child Weight Status. *Journal of Nutrition Education and Behavior, 43*, 396-400.

Moore, L.L., Gao, D., Bradlee, L., Cupples, L., Sundarajan-Ramamurti, A., Proctor, MH., et al. (2003). Does early physical activity predict body fat change throughout childhood? *Preventive Medicine, 37,* 10–17.

Mo-suwan, L. (2000). The determinants of overweight tracking from childhood to adolescence: a 5 y follow-up study of Hat Yai schoolchildren. *International Journal of Obesity*, 1642-1647.

Mo-suwan, L. (2008). Childhood obesity: an overview. *Siriraj Medical Journal, 60,* 37–40.

National Heart, Lung, and Blood Institute (NHLBI). (1998). *Clinical guideline on the identification, evaluation, and treatment of overweight and obesity in adults: The evidence report.* National Institutes of Health: Washington,DC. p. 1-262.

National Heart, Lung, and Blood Institute (NHLBI). (2000). *The practical Guide to Identification, Evaluation, and Treatment of Overweight and Obesity in Adults.* National Institutes of Health: Washington, DC. p. 1-94.

Najjar, M.F., & Rowland, M. (1987). *Anthropometric reference data and prevalence of overweight.* United States, 1976-80. Vital Health Stat 11, 238: p.1-73.

Neumark-Sztainer, D., Wall, M., Eisenberg, M., Story, M., & Hannan, P. (2006) Overweight status and weight control behaviors in adolescents: Longitudinal and secular trends from 1999 to 2004. *Preventive Medicine, 43,* 52–59.

NCHS. (1987). *Anthropometric Reference Data and Prevalence of Overweight: United States, 1976-1980.* Public Health Service: Hyattsville, MD.p. Report N0.: (PHS) 87-1688 (Vital and Health Statistics; vol.11).

Nuchanon,N. (2003). *The application of school health promotion model on nutrition promotion in primary school students of department of education Bangkok Metropolitan.* A thesis submitted in partial fulfillment of the requirements for the Degree of Master of Science (Public Health Major in Public Health Nursing), Faculty of Graduate Studies, Mahidol University.

Ochoa, M., Moreno-Aliaga, M., Martínez, A., & Marti, A. (2007). Predictor factors for childhood obesity in a Spanish case-control study. *Nutrition, 23,* 379–384.

O'Connor, T., Yang, S-J., & Nicklas., T. (2005). Beverage Intake Among Preschool Children and Its Effect on Weight Status. *Pediatrics, 118(4),* 1010-1018.

Ohri-Vachaspati, P., Turner, L., & Chaloupka, F.J. (2012) Fresh Fruit and Vegetable Program Participation in Elementary Schools in the United States and Availability of Fruits and Vegetables in School Lunch Meals. *Journal of the Academic of Nutrition and Dietetics, 112,* 921-926.

Ohri-Vachaspati, P., Turner, L., & Chaloupka, F.J. (2013). Elementary school participation in the United States Department of Agriculture's Team Nutrition Program: Is associated with more healthful school lunches. *Journal of Nutrition Education and Behavior, 45,*733-738.

Olds, T.S., Tomkinson, G.R., Ferrar, K.E., & Maher, C.A. (2010). Trend in the prevalence of childhood overweight and obesity in Australia between 1985 and 2008. *International Journal of obesity, 34,* 57-66.

Padez, C. (2006). Trends in overweight and obesity in Portuguese conscripts from 1986 to 2000 in relation to place of residence and educational level. *Public Health, 120,* 946–952.

Parikh, N., Pencina, M., Wang, T., Lanier, K., Fox, C., D'Agostino, R., et al. (2007).Increasing Trends in Incidence of Overweight and Obesity over 5 Decades. *The American Journal of Medicine, 120,* 242-250.

Pearce, A., Li, L., Abbas, J., Ferguson, B., Graham, H., & Law, C. (2010). Is childcare associated with the risk of overweight and obesity in the early year? Findings from the UK millennium cohort study. *International Journal of Obesity, 34,* 1160-1168.

Pearson, N., Biddle, S., & Gorely, T. (2008). Family correlates of fruit and vegetable consumption in children and adolescents: a systematic review. *Public Health Nutrition, 12(2),* 267–283.

Peneau, S., Salanave, B., Maillard-Teyssier, L., Rolland-Cachera, M-F., Vergnaud, A-C., Mejean, C., Czernichow, S., Vol, S., Tichet, J., Castetbon, K., & Hercberg, S. (2009). Prevalence of overweight in 6- to 15-year-old children in central/western France from 1996 to 2006: trends toward stabilization. *International Journal of obesity, 33,* 401-407.

Penn, D.M., Fischer, J.G., Sun Lee, J., Hausman, D.B., & Johnson, M.A. (2009). High BMI and waist circumference are associated with a high prevalence of comorbidities in older Americans act programs in Georgia senior centers.*The Journal of Nutrition, Health and Aging, 1(9),* 827-32.

Pereira, M., FitzGerald, S., & Gregg, E. (1997). *A collection of Physical Activity Questionnaires for Health-Related Research; Official Journal of the American college of sport medicine.* Atlanta, USA. S19-S24.

Perri, M.G., & Corsica, J.A. (2002). *Improving the maintenance of weight lost.* In:Wadden, TA., Stunkard, AJ. Handbook of Obesity Treatment. New York: Guilford Press, 357-379.

Peunposop N., Wongboonsin, K., & Kost, G. (2011). Schemes and barriers relating to childhood over nutrition control in Thailand. *Journal of Public Health and Development, 9(1),* 56-71.

Phadaennok, N. (2010). Effect of Implementing an Action Plan Based on AIC Technique on Community Participation in Physical Exercise. A thesis submitted in partial fulfillment of the requirements for the Degree of Master of Science (Public Health), Faculty of Graduate Studies, Mahidol University.

Phulkered, S., Pongutta, S., Thamarengsi, T., & Patcharanarumol, W. (2011). Lessons Learned from International Experiences and Changes to Future Food and Nutrition Policy in Thailand. *Journal of Health Science, 20(2),* 345-355.

Physical Activity Guidelines Advisory Committee. (2008). *Physical Activity Guidelines Advisory Committee report,* 2008. Washington, DC: US Department of Health and Human Services.

Plowman, S., & Smith, D. (2011). *Exercise physiology for health, fitness, and performance.* (3rd ed). USA. Lippincott Williams & Wilkins, a Wolters Kluwer business.1-20.

Polit, D., & Beck, C. (2006). *Essentials of nursing research methods, Appraisal, and utilization.* (6th ed). Philadelphia: Lippincott Williams& Wilkins, Philadelphia. USA.

Polit, D., & Hungler, B. (1987). *Nursing research principles and methods.* (3rd ed). Philadelphia: Lippincott Williams& Wilkins, Philadelphia. USA.

Pongpitak,D., Haputta, C.,& Robchanachai, C. (2008). The development of obesity control model in elementary school students, Petchabun Province. *Journal of nursing science Naresuan University, 2*, 65-73.

Pornpojamarn, P. (2003). *The influence of parental child rearing practices on childhood obesity in primary schools in urban Bangkok.* A thesis submitted in partial fulfillment of the requirements for the Degree of Master of Science (Nutrition), Faculty of Graduate Studies, Mahidol University.

Poskitt, E., & Edmunds, L. (2008). *Management of childhood obesity*. Cambridge: Cambridge University.

Powell, L., Slater, S., & Chaloupka, F. (2004). The relationship between community physical activity settings and race, ethnicity and socioeconomic status. Evidence-Based. *Preventive Medicine, 2,* 135– 144.

Pratanaphon, S., Chamnongkich, S., & Hensangvilai, K. (2007). The development of prediction equations for BMI and fat mass from simple anthropometry in 6 to 8 year old children. *Chiang Mai Medical Journal, 46(1),* 31-38.

Punlainak, N., Visatsiri, P., & Sucheva, S. (2010). Development of a primary school administrative system to promote holistic health and hygiene. Bangkok, Office of education council. *Retrieved July 9, 2011, from* http://www.thaiedresearch.org/thaied/index.php?-table=thaied_articles.

Qiao, Q., & Nyamdorj, R. (2010). The optimal cutoff values and their performance of waist circumference and waist-to hip ratio for diagnosing type II diabetes. *European Journal of Clinical Nutrition, 64,* 23-29.

Rahman, T., Cushing, R.A., & Jackson, R.J. (2011). Contributions of Built Environment to Childhood Obesity. Mount Sinai. *Journal of Medicine, 78,* 49–57.

Rey-Lopez, J., Vicente-Rodriguez, G., Biosca, M., & Moreno, L. (2008) .Sedentary behaviour and obesity development in children and adolescents. *Nutrition, Metabolism & Cardiovascular Diseases, 18,* 242-251.

Rice, R. (2006). *Home care nursing practice: Concepts and applications.* (4th ed.). Missouri, MO: Mosby elsevier.

Riddoch, C. (2010). The prevalence of children's physical activity. In Bouchard, C., & Katzmarzyk, PT, *Physical activity and obesity* (2nd ed., pp. 44). Champaign, IL: Human Kinetics.

Roberto, B., Degano, C., Leonardi, D., Vigneri, R., & Frittitta, L. (2006). High prevalence of overweight and obesity in 11-15-year-old children from Sicily. *Nutrition, Metabolism & Cardiovascular Diseases, 16,* 249-255.

Robinson-O'Brien, R., Neumark-Sztainer, D., Hannan, P., Burgess-Champoux, T., & Haines, J. (2009). Fruits and Vegetables at Home: Child and Parent Perceptions. *Journal of Nutrition Education and Behavior, 41,* 360-364.

Rosenthal,S., & Gitelman, S. (2002). Endocrinology. In A. Rudolph, R. Kamei, & K. Overby (Eds.), *Rudolph's fundamentals of pediatrics* (3rd ed., pp. 745-795). New York: McGraw; Hill.

Roussel, L., Swansburge, R.C., & Swansburg, R.J. (2006). *Management and leadership for nurse administrators.* (7th ed). USA. Jones and Bartlett Publishers, Inc., 140-141.

Ruangdaraganon, N., Kotchabhakdi, N., & Udomsubpayakul, U. (2002). The association between television viewing and childhood obesity: a national survey in Thailand. *Journal of the Medical Association of Thailand. 85(4),* S1075-S1080.

Sabin, M., Werther, G., & Kiess, W. (2011). Genetics of obesity and overgrowth syndromes. *Best Practice & Research Clinical Endocrinology & Metabolism, 25,* 207–220.

Sacks, F.M., Bray, G.A., Carey, V.J., Smith,S.R., Ryan, D.H., Anton,S.D., et al.(2009).Comparison of Weight-Loss Diets with Different Compositions of Fat, Protein, and Carbohydrates. *The New England Journal of Medicine, 360,* 859-873.

Sakamoto, N., Wansorn, S., Tontisirin, K., & Marui, E. (2001). A social epidemiologic study of obesity among preschool children in Thailand. *International Journal of Obesity, 25,* 389-394.

Salmon, J., Booth, M., Phongsavan, P., Murphy, N., & Timperio, A.(2007). Promoting Physical Activity Participation among Children and Adolescents. *Epidemiol Rev, 29,*144–159.

Sangthien, N. (2006). The effectiveness of the nutrition counseling intervention on weight control program in obese school-aged children. A thesis submitted in partial fulfillment of the requirements for the Degree of Master of Science (Nutrition), Faculty of Graduate Studies, Mahidol University.

Sariganont, N. (2008). *Development of instruction media for behavior modification related to weight management among fourth grade.* A thesis submitted in partial fulfillment of the requirements for the Degree of Master of Science (Nutrition), Faculty of Graduate Studies, Mahidol University.

Seal, N., & Broome, M. (2011). Evidence-Based Interventions for Pediatric Weight Control. *American College of Nurse Practitioners, 7(4),* 293-302.

Scaglioni, S., Salvioni, M., & Galimberti, C. (2008). Influence of parental attitudes in the development of children eating behavior. *British Journal of Nutrition, 99,* Suppl. 1, S22–S25.

Schacter, D.L., Gilbert, D.T., & Wegner, D.M. (2011). *Psychology*. (2 rd ed.). New York, NY: Worth Publishers.

Shahar, D., Henkin, Y., Rozen, G., Adler, D., Levy, O., Safra, C., et al. (2009). A controlled intervention study of changing health-provideers' attitudes toward personal lifestyle habits and health-promotion skills. *Nutrition, 25,* 532-539.

Sharma, S.K., Ghimire, A., Radhakrishnan, J., Thapa, L., Shrestha, N.R., Paudel, N., et al. (2011). Prevalence of Hypertension, Obesity, Diabetes,and Metabolic Syndrom in Nepal. *International Journal of Hypertension, 24,* 1-9.

Singh, G., Siahpush, M., & Kogan, M. (2010). Rising Social Inequalities in US Childhood Obesity, 2003–2007.*Annal of Epidemiology, 20,* 40–52.

Sirikulchayanonta, C., Pavadhgul, P., Chongsuwat, R., & Klaewkla, J. (2010). Participatory Action Project in reducing childhood obesity in Thai primary school. *Asia-Pacific Journal of Public Health, 10,* 1-11.

Sirikulchayanonta, C., Ratanopas, W., Temcharoen, P., & Srisorrachatr, S. (2011). Self discipline and obesity in Bangkok school children. *Public Health, 11,* 1-8.

Skelton, J.A., Irby, M.B., Beech, B.M., & Rhodes, S.D. (2012). Attrition and Family Participation in Obesity Treatment Programs: Clinicians' Perceptions. *Pediatric Obesity Clinicians Perceptions of Attrition, 12,* 420-428.

Small, B.M., & Strasser, A. (2007). Preventing obesity in young children: Where theory meets practice. *Advance for Nurse Practitioners, 15,* 35–40.

Smith, W.E. (1991). *The AIC Model: Concepts and Practice*. Washington, D.C.: ODII.

Snijder, M.B., Van Dam, RM., & Visser, M. (2006). What aspects of body fat are particularly hazardous and how do we measure them? *International Journal of Epidemiology, 35(1),* 83-92.

Sothern, M. (2004). Obesity Prevention in Children: Physical Activity and Nutrition. *Nutrition, 20,* 704 –708.

Spear, B. (2007). Recommendations for treatment of child and adolescent overweight and obesity. *Pediatrics, 120 (4),* S254-S288.

Springer, A.E., Kelder, S.H., Barroso, C.S., Drenne, K.L., Shegog, R., Ranjit, N., et al. (2010). Parental influences on television watching among children living on theTexas–Mexico border. *Preventive Medicine, 51,* 112–117.

Stalter, A.M, Kaylor, M., Steinke, J.D., & Barker, R.M. (2011). Parental Perceptions of the Rural School's Role in Addressing Childhood Obesity. *The Journal of School Nursing, 27,* 70-80.

Stanhope, M., & Lancaster, J. (2010). *Foundations of nursing in the community; Community-oriented practice.* (3rd ed). USA. Mosby Elsevier., 195.

Stewart, L. (2001). Childhood obesity. *Medicine, 39(1),* 42-44.

Stewart David, W., Prem, N., Shamdasani, & Dennis, W.R. (2007), *Focus groups: theory and practice,* Thousand Oaks : SAGE Publications.

Stratton, G., Fairclough, S.J., & Ridgers, N.D. (2008). Physical Activity Levels During the School day. In Smith, AL., & Biddle SJH (Eds.), *Youth Physical activity and sedentary behavior Challenges and solutions* (pp.321). Champaign, IL: Human Kinetics.

Stisen, A.B., Stougaard, O., & Langfort, J. (2006). Maximal fat oxidation rates in trined and untrained women. *European Journal of Applied of Physiology, 98*, 497-506.

Sturm, R., & Datar, A. (2005). Body mass index in elementary school children, metropolitan area food prices and food outlet density. *Public Health, 119(12),* 1059–1068.

Su, J., Nzekwu, M., Ball, G., Jetha, M., & Proctor, S. (2009) .Postprandial lipemia as an early predictor of cardiovascular complications in childhood obesity. *Journal of Clinical Lipidology, 3,* 78–84.

Susan, G.D. (2010). 6th edit. *Nutrition Essentials for nursing practice.* USA.Lippincott Williams& Wilkins.

Svendsen, O., Haarbo, J., Hassager, C., & Christiansen, C. (1993). Accuracy of measurements of body composition by dual-energy x-ray absorptiometry in vivo. *Journal of Clinical Nutrition, 57,* 605-608.

Tanner, J.M. (1990). *Foetus into man* (revised and enlarged ed.) Cambridge, MA: Harvard University Press.

Tanwattana, T. (2007). *Effectiveness of health education program in modifying eating behavior of students who are overweight.* A thesis submitted in partial fulfillment of the requirements for the Degree of Master of Science (Public Health), Faculty of Graduate Studies, Mahidol University.

Taylor, R., Jones, I., Williams, S., & Goulding, A. (2000). Evaluation of waist circumference, waist-to-hip ratio, and the conicity index as screening tools for high trunk fat mass, as measured by dual-energy X-ray absorptiometry, in children aged 3–19 y. *The American Journal of Clinical Nutrition ,72,* 490–495.

Taylor, R., McAuley, K., Barbezat, W., Strong, A., Williams, S., & Mann, J. (2007). APPLE Project: 2-y findings of a community-based obesity prevention program in primary school-age children. *The American Journal of Clinical Nutrition, 86,* 735-742.

Terry, T., & Grimm, B. (2011). A systems-based typological framework for understanding the sustainability, scalability, and reach f childhood obesity interventions. *Children's health care, 40,* 253-266.

Tester, J., Stevens, S., Yen, I., & Laraia, B. (2010). Effective use of frameworks and research to advance policy; An Analysis of public health policy and legal issues Relevant to mobile food vending. *American Journal of Public Health, 100(11),* 2038-2046.

Thai Recommended Daily Intakes / Thai RDI. (2013). In *Food Network Solution.* Retrieved Sep 25, 2013, from http://www.foodnetworksolution.com

The Scottish Government. (2010). *Preventing Overweight and Obesity; A Route Map Towards Healthy Weight.* Edinburgh, Scotland, 30.

Thomas, H. (2006). Obesity prevention programs for children and youth: why are their results so modest?. *Heath education research: Theory and Practice, 21(6),* 783-795.

Thompson, D., Baranowski, T., Cullen, K., Watson, K., Liu, Y., Canada, A., et al. (2008). Food, fun, and fitness internet program for girls: Pilot evaluation of an e-Health youth obesity prevention program examining predictors of obesity. *Preventive Medicine, 47,* 494–497.

Thorpe, M.P., & Randal, D.D. (2008). Families and obesity: A family process approach to obesity in adolescents. In Fitzgerald, HE, & Mousouli, V. (Eds), *Obesity in childhood and adolescence Volume 2 Understanding development and prevention* (pp.117). Westport, CT: Greenwood Publishing Group.

Thepprasit, K. (2009). The effectiveness of Computer-Assisted instruction “Fun with nutrition” for prevention of childhood obesity. A thesis submitted in partial fulfillment of the requirements for the Degree of Master of Science (Nutrition), Faculty of Graduate Studies, Mahidol University.

Towns, N., & Auria, J. (2009). Parental Perceptions of Their Child’s Overweight: An Integrative Review of the Literature. *Journal of Pediatric Nursing, 24(2),* 115-129.

Tripathi, S., Jiamsajamongkol, C., & Chokthanavanish P. (2008). Pilot analytic prospective study to compare knowledge, attitude and change in sugar intake from food and drink in two elementary schools after different intervention in Bangkok. *Thai Journal Pediatrics, 47,* 200-207.

Tsiros, M.D., Olds, T., Buckley, J.D., Grimshaw, P., Brennan, L., Walkley, J., et al. (2009). Health-related quality of life in obese children and adolescents. *International Journal of Obesity, 33,* 387-400.

Uphoff, N.T., Cohen, M.J., & Goldsmith, A.A. (1979). *Feasibility and application of rural development participation: A state-of the art paper rural development committee center for intentioned studies.* USA. Cornell University, 286-338.

USDHHS, NIH, NIDDK, Weight Control information Network (WIN). (2007). Statistics related to overweight and obesity. Available at http://win.niddk.nih.gov/publications/PDFs/ stat904z.pdf. Accessed on 1/28/08.

Vanhala, M., Korpelainen, R., Tapanainen, P., Kaikkonen, H., & Saukkonen, T. (2009). Lifestyle risk factors for obesity in 7-year-old children. *Obesity Research & Clinical Practice, 3,* 99-107.

Vereecken, C., Rovner, A., & Maes, L. (2010). Associations of parenting styles, parental feeding practices and child characteristics with young children's fruit and vegetable consumption. *Appetite, 55,* 589–596.

Wan, Y.P., Xu, R.Y., Wu, Y.J., Chen, Z.Q., & Cai, W. (2009). Diet intervention on obese children with hypertension in China. *World Journal of Pediatrics ,5(4),* 269-274.

Wanda, Z., & Kridli, S. (2009). Integrative Review of School-based Childhood Obesity Prevention Programs. *Journal of Pediatric Health Care, 23(4),* 242-258.

Wang, J., Thornton, J.C., & Bari, S. (2003). Comparison of waist circumferences measured at 4 sites. *The American Journal of Clinical Nutrition,77,* 379–384.

Wang, J., Thornton, J.C., Kolesnik, S., & Pierson, J.R. (2002). Anthropometry in Body Composition: An Overview. *Annals of the New York A cademy of sciences, 904,* 317-326.

Warren, J., Henry, C., Lightoweler, H., Bradshaw, S., & Perwaiz, S. (2003). Evaluation of a pilot school program aimed at the prevention of obesity in children. *Health Promotion International, 18(4),* 287-296.

Weides, J., Marcus, M., Kalarchian, M., Levine, M., Houck, P., & Cheng, Y. (2010). Self-reported binge eating in severe pediatric obesity: impact on weight change in a randomized controlled trial of family-based treatment. *International Journal of Obesity, 34,* 1143-1148.

Weigel, C., Kokocinski, K., Lederer, P., Dotsch, J., Rascher, W., & Knerr, I. (2008). Childhood Obesity: Concept, Feasibility, and Interim Results of a Local Group-based, Long-term Treatment Program. *Journal of Nutrition Education and Behavior, 40,* 369-373.

Wells, J., & Fewtrell, MS. (2008). Is body composition important for paediatricians? *Archives of Disease in Childhood, 93,* 168-172.

Wen, L.M., Baur, L.A., Rissel, C., Wardle, K., Alperstein, G., & Simpson, J.M. (2007). Early intervention of multiple home visits to prevent childhood obesity in a disadvantaged population: a home-based randomized controlled trial (Healthy Beginnings Trial), *BMC Public Health, 7(76),*1-8.

Whittemore, R., Chao, A., Jang, M., Jeon, S., Liptak , T., Popick, R., et al., (2013) Implementation of a School-based Internet Obesity Prevention Program for Adolescents. *Journal of Nutrition Education and Behavior, 45,* 586-594.

Williamson, D., Champagne, C.M., Harsha, D., Martin, C.K., Newton, R., Stewart, T.M., et al. (2008). Louisiana (LA) Health: Design and methods for a childhood obesity prevention program in rural schools. *Contemporary Clinical Trials, 29,* 783–795.

Wofford, L. (2008). Systematic Review of Childhood Obesity Prevention. *Journal of Pediatric Nursing, 23(1),* 5-17.

Wong, M., Lee, A., Sun, J., Stewart, D., Cheng, R., Kan, W., & Ho, M. (2009). A comparative study on resilience level between WHO health promoting schools and other schools among a Chinese population. *Health Promotion International, 24(2),* 149-155.

Wood, M. (2010). Hey mom, what's for dinner? Parents' feeding styles may affect kids' obesity. *Agricultural Research, 58,* 3-6.

Woodward-Lopez, G., Gosliner, W., Samuels, S., Craypo, L., Kao, J., & Crawford, P. (2010). Lessons learned from evaluations of California's statemide school nutrition standards. *American Journal of Public Health, 100(11),* 2137-2145.

Worthya, S.L., Lokkenb, K., Pilchera, K., & Boekac, A. (2010). Demographic and lifestyle variables associated with obesity. *Health Education Journal, 69(4),* 371-380.

Wren, B.G., & Nachtigall, L.E (Eds.). (1996). Clinical management of the menopause.Printed in Australia (Sydney) by McPheson's Printing Group, 9-12.

Wright, K., Giger, J., Norris, K., & Suro, Z. (2012). Impact of a nurse-directed, coordinated school health program to enhance physical activity behaviors and reduce body mass index among minority children: A parallel-group, randomized control trial. *International Journal of Nursing Studies, 50,* 727–737.

Yackobovitch-Gavan, M., Nagelberg, N., Phillip, M., Ashkenazi-Hoffnung, L., Hershkovitz, E., & Shalitin, S. (2009) The influence of diet and/or exercise and parental compliance on health-related quality of life in obese children. *Nutrition Research, 29,* 397–404.

Yamborisut, U., Sakamoto, N., Wimonpeerapattana, W., & Tontisirin, K. (2010). Waist circumference and body fat distribution indexes as screening tools for the overweight and obesity in Thai preschool children. *Obesity Research & Clinical Practice, 4,* e307-e314.

Yannakoulia, M., Ntalla, I., Papoutsakis, C., Farmaki, A-E., & Dedoussis , GV. (2010). Consumption of Vegetables, Cooked Meals, and Eating Dinner is Negatively Associated with Overweight Status in Children. *The Journal of pediatrics, 157 (5),* 815-820.

Yoon, J-S., & Lee, N-J. (2010). Dietary patterns of obese high school girls: snack consumption and energy intake. *Nutrition Research Practice, 4(5),* 433–437.

Young Shin, N., & Sup Shin, M. (2008). Body Dissatisfaction, Self-Esteem, and Depression in Obese Korean Children. *Journal of Pediatrics, 152,* 502-506.

Zhang, C-X., Chen, Y-M., Chen, W-Q., Deng, X-Q., & Jiang, Z-Q. (2008).Energy expenditure and energy intake in 10-12 years obese and non-obese Chinese children in a Guangzhou boarding school. *Asia Pacific Journal of Clinical Nutrition, 17(2),* 235-242.

Zhang, X., Yao, S., Sun, G., Yu, S., Sun, Z., Zheng, L., et al. (2012). Total and abdominal obesity among rural Chinese women and the association with hypertension. *Nutrition, 28*, 46–52.

Zhang, Y., & Wildemuth, B. (1996). Qualitative analysis of content. *Retrieved July 13, 2011, from www.ils.unc.edu/ yanz/content analysis.pdf.*

เอกสารอ้างอิงภาษาไทย

กรมอนามัย กระทรวงสาธารณสุข. (2542). *เกณฑ์อ้างอิง น้ำหนัก ส่วนสูง และเครื่องชี้วัดภาวะโภชนาการของประชาชนชาวไทย อายุ 1 วัน-19 ปี.* นนทบุรี: โรงพิมพ์ชุมนุมสหกรณ์การเกษตรแห่งประเทศไทย.

กองโภชนาการ. *รายงานการสำรวจภาวะอาหารและโภชนาการของประเทศไทย ครั้งที่ 5 พ.ศ. 2546.* จำนวน 365 หน้า อ้างใน http://nutrition.anamai.moph.go.th/download/nutrition2546.pdf.

สายนที ปรารถนาผล. (2549). *โรคอ้วนในเด็กและการจัดการ.* เชียงใหม่: ภาควิชากายภาพบำบัด คณะเทคนิคการแพทย์ มหาวิทยาลัยเชียงใหม่.

APPENDICES

APPENDIX A
LIST OF EXPERTS

There were five experts, who had validated the contents of research instruments including in-depth interview guideline, focus group guideline, parent's questionnaire, student's questionnaire, and school assessment.

1. Mrs. Nuttawan Chaolilitkul
   Nutritionist, senior professional level
   Bureau of Nutrition, Department of Health
   Ministry of Public Health
2. Mrs. Chatchadaporn Pitaksathienkul
   Sports development officer, Expert Level
   Sport Science Bureau, Department of Physical Education
   Ministry of Tourism and Sports
3. Lecturer. Dr. Tossaporn Yimlamai
   Department of Physiology
   Faculty of Science, Mahidol University
4. Assoc. Prof. Dr. Chanya Seartabut
   Institute for population and social research
   Mahidol University
5. Assoc. Prof. Dr. Chutima Sirikulchayanonta
   Department of Nutrition,
   Faculty of Public Health, Mahidol University

There were three experts, who examined the obesity control program.

1. Assoc.Prof.Dr.Krithakorn Pratumvong
   Department of Health Education,
   Faculty of Physical Education, Srinakharinwirot University
2. Assist. Prof. Dr. Rewadee Chongsuwat
   Department of Nutrition,
   Faculty of Public Health, Mahidol University
3. Lecturer. Orapin Banjong
   Institute of Nutrition, Mahidol University

APPENDIX B
THE ACTIVITIES FOR OBESITY CONTROL PROGRAM

The activities for obesity control program in DLHPS as follows:

1. Nutrition education

Nutrition education was conducted for students, parents, and food cookers. The contents for nutrition education composed of 6, 2, and 4 topics in students, parents, and food cookers, respectively. The contents of nutrition education were showed as follows:

For student:

The nutrition education programs were composed of six sessions to increase the knowledge of control obesity in students. The programs included the content from best program from 4 DLHPSs, review literature and participation in example school. These programs covered 6 important topics such as the knowledge and workshop included (a) the obesity and obesity assessment, (b) the five food components, (c) the quantity and energy of food, (d) the vegetable planting, (e) energy expenditure and exercise, and (f) the knowledge of nutrition label and danger of carbonate drink and snack. Therefore, the nutrition education programs consisted of six sessions that were presented as follows:

(a) The obesity and obesity assessment

Topic objectives

1. To enhance the understanding of cause, effect and prevention of obesity and control the weight to normal level

2. To increase the obesity assessment the nutrition status by growth curve

Activities

(1) Lecturing on cause, effect and prevention of obesity knowledge with power point and flip charts

(2) Discussing on the member of obesity person in student's home and conclusion

(3) ……..

(b) The five food components

Topic objectives

1. To enhance the information of type and 5 food components

2. To increase the understanding of food portion for consumption according to flag nutrition and 9 food protocols

3. To describe the type and benefit of 5 vegetable colors

Activities

(1) Lecturing on type and 5 food components with power point and poster

(2) Playing the 5 food components game by using the work sheet

(3) ……

(c) The quantity and energy of food

Topic objectives

1. To enhance the information of type, quantity and energy of food that receives per day

2. To increase the understanding of healthy food choosing and unhealthy food avoiding

Activities

(1) Lecturing on type, quantity and energy of food per day with power point and poster

(2) Educating students about the knowledge of obesity control program by food, the healthy food menu and the energy of each food

(3) ……...

(d) The vegetable planting

Topic objectives

1. To enhance the understanding of type and benefit of vegetable

2. To increase the skill of vegetable planting in their home

Activities

(1) Discussing on the type, quantity, and benefit of vegetable knowledge

(2) ……...

.

(e) Energy expenditure and exercise

Topic objectives

1. To enhance the understanding of appropriate and benefit of exercise

2. To arrange the energy of exercise in each type from high to low

Activities

(1) Asking the type, quantity and energy of exercise of students at school and home

(2) Lecturing on type, quantity and energy of exercise with power point

(3) ……...

(f) The knowledge of nutrition label and danger of carbonate drink and snack

Topic objectives

1. To enhance the information of nutrition label reading

2. To increase the understanding of danger of carbonate drink and snack

Activities

(1) Asking the frequency and type of snack per day

(2) Clarifying the nutrition label meaning and benefit in snack package

(3) ……...

For parents:

The nutrition education programs in parents were the important thing for support the obesity control in their children. Moreover, nutrition education in parent could enhance their obesity control knowledge in their children. Two sessions of obesity control knowledge were taught to parent. These programs covered 2 important topics such as the knowledge and workshop included (a) the obesity in children and prevention, and (b) the danger of carbonate drink/snack and nutrition label reading. The nutrition education programs were presented as follows:

(a) The obesity in children and prevention

Topic objectives

1. To enhance the knowledge of cause, effect and prevention of obesity and control the weight to normal level

2. To increase the obesity assessment the nutrition status by growth curve

3. To record the type and frequency of nutrition and physical or exercise per day

Activities

(1) Asking their children progression of nutrition status, food behavior, and exercise behavior

(2) Discussing on the problem and solving of obesity in their children

(3) ……...

(b) The danger of carbonate drink/snack and nutrition label reading

Topic objectives

1. To enhance the knowledge of healthy snack choosing and nutrition label reading

2. To increase the knowledge of carbonate drink and snack danger

Activities

(1) Asking their children progression of nutrition status, food behavior, and exercise behavior

(2) Discussing on the snack consumption behavior about type, frequency of snack

(3) ……...

For food cookers:

Nutrition education with food cooker was an activity that was done in food cookers. Four represent food cookers were selected from responsibility of them. These

food cookers had cooking in the meal lunch school time and preparing the snack in school cafeteria. They were received obesity control content about obesity control in their students. These programs covered 4 important topics such as the knowledge and workshop included the (a) the obesity in children and prevention, (b) the school lunch arrangement for normal weight in students, (c) the danger of carbonate drink, snack and healthy snack in school, and (d) the nutrition label reading. The nutrition education programs were presented as follows:

(a) The obesity in children and prevention

Topic objectives

1. To enhance the knowledge of cause, effect and prevention of obesity and control the weight to normal level

2. To increase the obesity assessment the nutrition status by growth curve

3. To record the type and frequency of nutrition and physical or exercise per day

Activities

(1) Creating the relationship to food cookers

(2) Clarify the objective and activities of obesity control objective

3)……...

(b)The school lunch arrangement for normal weight in students

Topic objectives

1. To enhance the knowledge of type and 5 food components

2. To increase the knowledge of food portion for consumption according to flag nutrition and 9 food protocols

3. To enhance the skill of school lunch planning

Activities

(1) Asking the type and 5 food components

(2) Lecturing on type, benefit of 5 food components with power point and poster

(3)……...

(c) The danger of carbonate drink, snack and healthy snack in school

Topic objectives

1. To enhance the knowledge of the danger of carbonate drink and snack

2. To increase the skill of food and snack selection in school

Activities

(1) Asking the knowledge using from the previous content to real situation

(2) Asking the type of food and snack that student favor and sale in school

(3)……...

(d)The nutrition label reading

Topic objectives

1. To enhance the knowledge of nutrition label reading

2. To increase the skill of beneficial comparing in snack

Activities

(1) Asking the method of snack choosing in school

(2) Clarifying the nutrition label meaning and benefit in snack package

(3) ……...

2. Teacher meeting for integrative the content to every subject

The activity that performed with teacher was integration the obesity control content in all subjects. Four meeting of teachers in each subject occurred in this program. The objectives of this activity were to increase the participation of integration the obesity control content in all subjects. For meeting 1, the researcher created the relationship and informed the reason for obesity control intervention in school. Explanation the example worksheet for integration the obesity control content to teacher team was done in this period. Representation the example of worksheet and discussion about the appropriate content was performed in meeting 2. For meeting 3, teachers and researcher discussed about appropriate content in work sheet and appointed available time to assign worksheet to students. Inspiration the teacher for integration the obesity control contents in all subjects and discussed about the result of worksheet in the last meeting. From this process, two worksheets per subjects were distributed to all students in grade 1-3. Eight subjects included the 1) Mathematics, 2) Thai language, 3) English language, 4) Arts, 5) Social, 6) Science, 7) Health education and physical, and 8) Home working and technology.

3. Healthy day/Healthy corner

The healthy day was the extra activity that included the knowledge and game about obesity control program such as healthy game and healthy exhibition.

The activity objectives

1. To enhance the skill of obesity prevention in students

2. To increase the awareness of obesity prevention in students

Activities

The 3 hours activity was done by researcher and teacher team. The detail of health activity that showed in activity table as follows:

Table Represent the healthy activity for obesity control in students

Date: Jan, 29, 2013; Time 1.00 P.M – 4.00 P.M.

Time	**Activities**	**Responsibility persons**
1.00 – 1.15 P.M.	Registering/Separation group (Yellow, Green, and Orange group)	Researcher team, Teacher
1.15 – 1.45 P.M.	Opening the activity and objective describing	School director
1.45 – 2.00 P.M.	Obesity control game Part I: Establishing group name in each group	Researcher team
2.00 – 2.40 P.M.	Part II: Game activity (4 sessions;20 seconds/session) Session 1: Food for fun Session 2: Funny loop	Researcher team
2.40 – 2.50 P.M.	Break and Healthy exhibition	Researcher team, Teacher
2.50 – 3.30 P.M.	Session 3: Happy star	Researcher team
3.30 – 3.40 P.M.	Part 3: Group activity -Conclusion the score and healthy content -Giving the reward for winning group -Closing the healthy activity	Researcher team, and Teacher

Healthy corner

Topic objectives

1. To enhance the knowledge of five food components and food portion per meal

2. To increase the skill of the healthy food choosing and obesity control

Activities

(1) Presentation the five food components poster

(2) Clarifying the type of vegetable classify by color

(3) ……...

4. Newsletter

The contents in newsletters had many benefic for prevention the obesity in their children. The contents of newsletters were represented as follows:

Time	Contents in newsletter
1	The situation of obesity in children, The factor of obesity in children, The tip of obesity control in children, The danger of obesity in children, …… ……
2	The unhealthy food effect to obesity in children, Fast food and obesity, The progression of obesity control program, …… ……
3	The physical activity and exercise effect to normal weight in children, The result of parent meeting in previous time, …… ……
4	Snack and obesity, Nutrition label reading in snack package, The news for meeting parent for obesity control program progression …… ……
5	Repeat the obesity control content for parents such as proportion of food per meal, Extra activity in obesity control program such as healthy activity, …… ……
6	Conclusion the obesity control program such as activity, The nutrition status progression of students, The picture of exercise in the morning.
7	Represent the nutrition status progression since start the obesity control program (for 3 time) by growth curve, Inspiration the students and parents for weight control, Thank you the students and parents for participation in obesity control program.

The exercise in the morning was performed about one month and 10 minute per day. The healthy day was conducted for 3 hours for knowledge providing and game about obesity control program.

5. Exercise in the morning

The exercise in the morning was performed in obesity control program for one month. The researcher and team were leader of aerobic by supporting from school director teacher, and nutrition education teacher.

The activity objectives

1. To enhance the skill of exercise
2. To increase the energy expenditure per day

Activities

(1) Demonstrating and practicing of aerobic by starting the warm up, exercise, and warm down

(2) Asking the feeling of students after finished exercise

(3) ……

APPENDIX C
QUESTIONNAIRES

1. The questionnaires of DLHPS

1.1 แนวคำถามสำหรับการสัมภาษณ์ ผู้อำนวยการโรงเรียน (12 ข้อ)

1. กรุณาเล่าให้ฟังหน่อยนะคะว่าโครงการควบคุมภาวะโภชนาการเกินในโรงเรียนเริ่มขึ้นเมื่อใด เกิดขึ้นได้อย่างไร ใครเป็นผู้ริเริ่ม และทำไมถึงทำโครงการนี้

2. การบริหารจัดการ และกระบวนการทำงานเป็นอย่างไร

3. ……....

1.2 แนวคำถามสำหรับการสัมภาษณ์ครู (10 ข้อ)

1. โครงการควบคุมภาวะโภชนาการเกิน มีขั้นตอนการดำเนินการอย่างไร มีกิจกรรมอะไรบ้าง และท่านมีบทบาทหน้าที่อะไรในโครงการฯ

2. ท่านคิดว่าจากการที่ดำเนินกิจกรรมของโครงการฯ นั้นมีปัญหาและอุปสรรคอะไรเกิดขึ้นบ้าง และท่าน แก้ไขปัญหานั้นอย่างไร

3. ……....

1.3 แนวคำถามสำหรับการสัมภาษณ์ผู้ประกอบอาหาร (12 ข้อ)

1.โครงการควบคุมภาวะโภชนาการเกิน มีขั้นตอนการดำเนินงานอย่างไร มีกิจกรรมอะไรบ้าง (โดยเฉพาะกิจกรรมที่เกิดขึ้นในโรงอาหาร) และท่านมีบทบาทหน้าที่อะไรในโครงการฯ

2.ก่อนและหลังทำโครงการฯ ท่านมีการเปลี่ยนแปลงการสิ่งแวดล้อมในโรงอาหารและการเตรียมอาหารสำหรับนักเรียนหรือไม่ อย่างไร

3. ……....

1.4 แนวคำถามสำหรับการสนทนากลุ่มนักเรียน (7 ข้อ)

1. โครงการควบคุมภาวะโภชนาการเกินในโรงเรียนมีกิจกรรมอะไรบ้าง และนักเรียนเข้าร่วมกิจกรรมอะไรบ้าง

2. ชอบในกิจกรรมไหนมากที่สุด และเบื่อกิจกรรมไหนมากที่สุด

3.……....

2. The questionnaires of children

ส่วนที่ 1 ข้อมูลทั่วไป

1. ชั้นประถมศึกษาที่.....ห้อง..... อายุ.....ปี

ส่วนที่ 2 ข้อมูลการรับรู้เกี่ยวกับภาวะโภชนาการเกินของตนเอง

การรับรู้เกี่ยวกับภาวะโภชนาการเกินของตนเอง	**ระดับการรับรู้ (จำนวนและร้อยละ)**		
	เห็นด้วย	**ไม่แน่ใจ**	**ไม่เห็นด้วย**
1. เมื่อก่อนหนูรู้สึกว่ามีสุขภาพที่ดีกว่านี้ ไม่เหนื่อยง่ายเวลาวิ่งเล่น			
2. เด็กวัยนี้ควรกินอาหารให้มาก ปริมาณไม่จำกัด เพื่อการเจริญเติบโต			
3.....			

ส่วนที่ 3 ข้อมูลเกี่ยวกับรูปแบบการบริโภคอาหารของเด็กนักเรียน

3.1 จำนวนมื้อการรับประทานอาหารของนักเรียนใน 1 วัน

มื้ออาหาร	**วันที่มาเรียนหนังสือ**			**วันหยุดเรียน**		
	รับประทาน <u>ทุกวัน</u>	**รับประทาน <u>บางวัน</u>**	**<u>ไม่</u> รับประทาน**	**รับประทาน <u>ทุกวัน</u>**	**รับประทาน <u>บางวัน</u>**	**<u>ไม่</u> รับประทาน**
อาหารว่างก่อนมื้อเช้า						
……						

3.2 จำนวนครั้งที่เด็กนักเรียนรับประทานอาหาร ในรอบ 1 สัปดาห์

ชนิดอาหาร	**ความถี่ในการรับประทานอาหาร**				
	ไม่กิน	**กินทุกวัน**	**ประจำ (4-6 ครั้งต่อสัปดาห์)**	**ครั้งคราว (1-3 ครั้งต่อสัปดาห์)**	**นานๆ ครั้ง (2-3 ครั้งต่อเดือน)**
1.ขนมหวานไทย					
2.เบเกอรี่					
3……					

ส่วนที่ 4 แบบบันทึกภาวะโภชนาการของเด็กนักเรียน

1. ภาวะโภชนาการ

ประเมิน / ครั้งที่	น้ำหนัก (กิโลกรัม)	ส่วนสูง (เซนติเมตร)	ความยาวรอบ (เซนติเมตร)		ความหนาของชั้นไขมัน (มิลลิเมตร)	
			วงต้นแขน	เอว	Triceps	Subscapular
1						
2						
3						
สรุป	……	……				
	☐ท้วม / ☐เริ่มอ้วน / ☐อ้วน		……	……	……	……

2. ผลการวัดเปอร์เซ็นของไขมันในร่างกาย (body fat percentage)

$$= \frac{[(0.342 \times \text{…..(น้ำหนัก)}] + [(0.256) \times \text{..……(Triceps)}] + [(0.837) \times \text{…….(เพศ)}] - 7.388}{\text{……(น้ำหนัก)}} \times 100$$

=……. **(**หมายเหตุ: เพศ = เพศชาย = 1, หญิง = 2)

ส่วนที่ 5 แบบทดสอบสมรรถภาพทางกายของเด็กนักเรียน

รายการทดสอบ	**ผลการทดสอบ**	
	ครั้งที่ 1	**ครั้งที่ 2**
1.ดันพื้น 30 วินาที (ครั้ง)		
2.ลุกนั่ง 60 วินาที (ครั้ง)		
3……		

ส่วนที่ 6 ข้อมูลเกี่ยวกับการบริโภคอาหารของเด็กนักเรียน

3.3. ข้อมูลชนิดของอาหารและปริมาณของการบริโภคอาหารของนักเรียน

เพื่อทราบปริมาณของการบริโภคอาหารของเด็กนักเรียน โดยใช้แบบบันทึกอาหารที่บริโภค ทำการบันทึกในวันที่มาเรียนหนังสือ 2 วัน (จันทร์ – ศุกร์) และวันหยุดเรียน 1 วัน (วันเสาร์-อาทิตย์)

บันทึกวัน ( ) จันทร์ ( ) อังคาร ( ) พุธ ( ) พฤหัสบดี ( ) ศุกร์ วันที่.....

(ผู้ปกครองสามารถช่วยลูกประเมินได้ โปรดระบุอาหารทุกชนิดที่รับประทานและบันทึกตามความเป็นจริงมากที่สุด)

มื้ออาหาร/เวลา	สถานที่	รายการอาหาร	ชนิดของอาหารที่เป็นส่วนประกอบ	ปริมาณอาหารที่บริโภค	หมายเหตุ

……

……

ส่วนที่ 7 ข้อมูลการทำกิจกรรมและออกกำลังกาย วันที่ไม่มีวิชาพลศึกษาและวันเดียวกันกับที่บันทึกการรับประทานอาหาร ทำการบันทึกในวันที่มาเรียนหนังสือ 2 วัน (จันทร์ – ศุกร์) และวันหยุดเรียน 1 วัน (วันเสาร์-อาทิตย์)

บันทึกวัน ( ) จันทร์ ( ) อังคาร ( ) พุธ ( ) พฤหัสบดี ( ) ศุกร์ วันที่.....

กิจกรรม	ช่วงเวลา	กิจกรรม	ช่วงเวลา
 **นอนหลับ**	ตั้งแต่..... ถึง.....	 **อาบน้ำ**	**เช้า**..... **เย็น**..... อาบน้ำครั้งละ..... นาที
 **รับประทานอาหาร**	**เช้า**..... **กลางวัน**..... **เย็น**..... รับประทานครั้งละ .....นาที	 **นั่งรถไป-กลับโรงเรียน**	**เช้า**..... **เย็น**..... เดินทางครั้งละ .....นาที
.....	.....	.....	.....
.....	.....	.....	.....

3. The questionnaires of parent

ส่วนที่ 1 ข้อมูลทั่วไป

1. ท่านมีความสัมพันธ์กับลูก/หลาน คือ

(1) พ่อ (2) แม่ (3) ปู่/ย่า

(4) ตา/ยาย (5) น้า/อา (6) พี่เลี้ยง (7) อื่นๆ ระบุ.....

2. ท่านอายุ.....ปี, น้ำหนัก..... กิโลกรัม,ส่วนสูง.....เซนติเมตร

3. .....

4. .....

5. .....

ส่วนที่ 2 ข้อมูลการรับรู้เกี่ยวกับภาวะโภชนาการเกินของลูก/หลาน (12 ข้อ)

การรับรู้เกี่ยวกับภาวะโภชนาการเกินของลูก/หลาน	**ระดับการรับรู้ (จำนวนและร้อยละ)**			
	เห็นด้วยอย่างยิ่ง	**เห็นด้วย**	**ไม่แน่ใจ**	**ไม่เห็นด้วย**
1.ท่านคิดว่าช่วงที่ ลูก/หลาน ของท่านมีรูปร่างอ้วน มักจะมีปัญหาสุขภาพน้อยกว่า ช่วงที่ลูก/หลาน มีรูปร่างสมส่วน				
2. ลูก/หลาน ในวัยนี้สามารถเลือกรับประทานอาหารได้ด้วยตนเอง				
3.				

ส่วนที่ 3 ข้อมูลชนิดของอาหารและปริมาณของการบริโภคอาหารของ แม่หรือพ่อ หรือผู้ดูแล ได้แก่ ปู่/ย่า ตา/ยาย น้า/อา/ป้า/ลุง หรือพี่เลี้ยง และลูก/หลาน (ใน 2 วันทำงาน และ 1 วันหยุด)

บันทึกวัน ( ) จันทร์ ( ) อังคาร ( ) พุธ ( ) พฤหัสบดี ( ) ศุกร์ วันที่.....

กลุ่มข้าว แป้ง	กลุ่มผัก	กลุ่มผลไม้	กลุ่มเนื้อสัตว์ ไข่	กลุ่มนม	กลุ่มไขมัน	กลุ่ม น้ำตาล
..... ทัพพี	..... ทัพพี	..... ส่วน	..... ช้อนกินข้าว	..... ส่วน	..... ช้อนชา	..... ช้อนชา

ส่วนที่ 4 ข้อมูลการทำกิจกรรมและออกกำลังกายในปัจจุบันของ แม่หรือพ่อ หรือผู้ดูแล ได้แก่ ปู่/ย่า ตา/ยาย น้า/อา/ป้า/ลุง หรือพี่เลี้ยง

บันทึกวัน ( ) จันทร์ ( ) อังคาร ( ) พุธ ( ) พฤหัสบดี ( ) ศุกร์

วันที่.....ท่านตื่นนอนเวลา.....น.

ช่วงเวลา	กิจกรรม	ช่วงเวลา	กิจกรรม

APPENDIX D
THE OBESITY CONTROL PROGRAM

1. The obesity control program for students

โปรแกรมการให้โภชนศึกษาสำหรับเด็กนักเรียนที่มีภาวะโภชนาการเกิน ชั้นประถมศึกษาปีที่ 1-3

ครั้งที่ 1: เรื่อง ...โรคอ้วน และการประเมินภาวะโภชนาการ

วัตถุประสงค์เฉพาะ : เพื่อให้นักเรียน

1. บอกสาเหตุ และผลกระทบ วิธีการป้องกันของโรคอ้วนได้
2. ประเมินภาวะโภชนาการโดยใช้กราฟการเจริญเติบโตในเด็กอายุต่ำกว่าปี 18ได้

สื่อการสอน

1. ภาพสไลด์ประกอบคำบรรยาย กิจกรรมของโครงการ
2. ใบความรู้ "โรคอ้วน สาเหตุ ผลกระทบและการป้องกัน"
3. ใบงานที่ 1 "โรคอ้วน เกิดจากอะไร"
4. ใบงานที่ 2 "ความสมดุลของพลังงานในร่างกาย"
5. ใบงานที่ 3 "การประเมินรูปร่างของตนเองด้วยกราฟการเจริญเติบโต"
6. เครื่องชั่งน้ำหนัก และเทปวัดส่วนสูง
7. กราฟน้ำหนักเทียบเกณฑ์ส่วนสูงของกรมอนามัย กระทรวงสาธารณสุข พ .ศ. 2542
8. การบ้าน "มหันตภัยของโรคอ้วน และการป้องกัน"

การประเมินผล

1. สังเกตความสนใจขณะดูภาพ ฟังบรรยาย และการทำกิจกรรม
2. สังเกตการมีส่วนร่วมในการซักถาม การเล่นเกม การแสดงความคิดเห็น และตอบคำถาม
3. นักเรียนสามารถบอกถึงสาเหตุของโรคอ้วนและการป้องกันโรคอ้วนได้อย่างน้อย 2 ข้อ
4. นักเรียนสามารถชั่งน้ำหนัก และวัดส่วนสูงได้อย่างถูกต้อง
5. นักเรียนสามารถอธิบายและประเมินผลภาวะโภชนาการโดยใช้น้ำหนักเทียบตามเกณฑ์ส่วนสูง และเทียบกับกราฟของกรมอนามัย กระทรวงสาธารณสุข พ .ศ.2542 ของตนเองได้อย่างถูกต้อง
6. การให้ความร่วมมือในการทำการบ้าน ตามเอกสารที่ให้

ครั้งที่ 2: เรื่อง ...อาหารและการบริโภคให้ถูกหลักโภชนาการ

วัตถุประสงค์เฉพาะ : เพื่อให้นักเรียน

1. บอกหรือยกตัวอย่าง ประเภท ชนิดของอาหารได้อย่างน้อย 3 ประเภท
2. อธิบายประโยชน์ของอาหารหลัก 5 หมู่ได้ถูกต้องและครบถ้วน
3. อธิบายสัดส่วนของหมวดอาหารที่ควรได้รับตามธงโภชนาการ
4. บอกหลักปฏิบัติของโภชนบัญญัติ 9 ประการเพื่อไปใช้ในชีวิตประจำวัน อย่างน้อย 5 ข้อ
5. อธิบายประโยชน์ของผัก และยกตัวอย่างประเภทของผัก 5 สีได้ถูกต้องและครบถ้วน

สื่อการสอน

1. ภาพสไลด์ประกอบคำบรรยาย สรุปการทำกิจกรรมครั้งก่อน ภาพธงโภชนาการและโภชบัญญัติ 9 ประการ
2. โปสเตอร์ “ธงโภชนาการ” และ “โภชนบัญญัติ 9 ประการ”
3. ใบความรู้ “มารู้จักอาหารหลัก 5 หมู่กันเถอะ”
4. ใบงานที่ 1 “มารู้จักอาหารหลัก 5 หมู่กันเถอะ”
5. ใบงานที่ 2 “มาแยกผักในจานอาหารกันเถอะ”
6. ใบงานที่ 3 “พาน้องร้องเพลง ธงโภชนาการ”
7. ตัวอย่างอาหารจริงและแบบจำลองอาหาร
8. วีดีทัศน์เพลง ธงโภชนาการ
9. อาหารจานเดียว ประมาณ 4-5 ชนิด
10. โปสเตอร์ “ผัก 5 สีแสนอร่อย” และ “มหัศจรรย์ ผักเพิ่มพลัง”
11. การบ้าน “มารู้จักอาหารหลัก 5 หมู่กันเถอะ”

การประเมินผล

1. สังเกตความสนใจขณะดูภาพ ฟังบรรยาย และการทำกิจกรรม
2. สังเกตการมีส่วนร่วมในการซักถาม การเล่นเกม และการแสดงความคิดเห็น
3. นักเรียนสามารถบอกถึงชนิดของอาหารหลัก 5 หมู่ สัดส่วนของอาหารที่ควรได้รับตามธงโภชนาการ และข้อควรปฏิบัติในโภชนบัญญัติ 9 ประการ
4. นักเรียนสามารถรับประทานผัก และบอกประเภทของผัก 5 สีได้
5. การให้ความร่วมมือในการทำการบ้าน ตามเอกสารที่ให้

ครั้งที่ 3: เรื่อง ... ปริมาณและพลังงาน ในอาหารที่นักเรียนบริโภค

วัตถุประสงค์เฉพาะ : เพื่อให้นักเรียน

1. อธิบายสัดส่วนอาหารและพลังงานที่ควรจะได้รับจากอาหารต่อวันได้
2. เลือกเมนูอาหารสุขภาพอย่างเหมาะสมตามพลังงาน และสัดส่วนอาหารที่ควรได้รับในวัน
3. ยกตัวอย่างประเภทอาหารที่ให้ไขมันสูงได้

สื่อการสอน

1. ภาพสไลด์แสดงตัวอย่างพลังงานในอาหาร
2. ใบความรู้ “ตัวอย่างอาหารและพลังงานที่ได้รับ”
3. ใบงานที่ 1 “พลังงานที่ได้รับจากอาหาร”
4. ใบงานที่ 2 “เลือกเมนูอาหารสุขภาพ”
5. ใบงานที่ 3 “พลังงานจากอาหารใน 1 วัน”
6. ใบงานที่ 4 “เลือกปริมาณอาหารตามธงโภชนาการ”
7. โปสเตอร์ “กินผักทุกวัน เด็กไทยทำได้ เรื่อง เมนูจานผัก”
8. การบ้าน “ตัวอย่างอาหารและพลังงานที่ได้รับ”

การประเมินผล

1. นักเรียนสามารถอธิบายสัดส่วนของอาหาร และพลังงานที่ควรได้รับในแต่ละวัน
2. นักเรียนสามารถคำนวณพลังงานที่ได้รับจากอาหารอย่างถูกต้อง
3. นักเรียนสามารถเลือกเมนูอาหารสุขภาพและบอกประเภทของอาหารที่ให้พลังงานสูงได้

ครั้งที่ 4: เรื่อง ...มาปลูกผักสวนครัวกันเถอะ

วัตถุประสงค์เฉพาะ: เพื่อให้นักเรียน

1. บอกประเภทผักสวนครัวได้อย่างน้อย 3 ชนิด
2. บอกประโยชน์ของผักที่มีต่อร่างกายได้อย่างน้อย 3 ข้อ
3. บอกวิธีและปฏิบัติการปลูกผักสวนครัวที่บ้านได้

สื่อการสอน

1. โปสเตอร์ ธงโภชนาการ
2. ใบความรู้ “มาปลูกผักสวนครัวกันเถอะ”
3. ใบงานที่ 1 “มาเรียนรู้ชนิดของผักสวนครัวกันเถอะ
4. ใบงานที่ 2 “หนูจะปลูกผักสวนครัวอะไรดีนะ”
5. เมล็ดภัณฑ์ผักประมาณ 4-5 ชนิด

6. การบ้าน “มาปลูกผักสวนครัวกันเถอะ”
7. ภาพสไลด์ประกอบเนื้อเพลง “ธงโภชนาการ”

การประเมินผล

1. สังเกตความสนใจขณะฟังบรรยายและการทำกิจกรรม
2. สังเกตการณ์มีส่วนร่วมในการซักถาม การเล่นเกม และการแสดงความคิดเห็นในกลุ่มย่อย
3. นักเรียนสามารถบอกประเภทของผักสวนครัวและประโยชน์ของผักที่มีประโยชน์ต่อร่างกาย
4. นักเรียนสามารถบอกวิธีการปลูกผักสวนครัว และวิวัฒนาการของผักที่นำไปปลูกได้ในทุกสัปดาห์ที่มีการทำกิจกรรมการสอน

ครั้งที่ 5: เรื่อง …กิจกรรมการใช้พลังงานและการออกกำลังกาย

วัตถุประสงค์เฉพาะ: เพื่อให้นักเรียน

1. บอกประโยชน์ ของการออกกำลังกายได้อย่างเหมาะสม อย่างน้อย 3 ข้อ
2. เลือกวิธีการออกกำลังกายที่เหมาะสมกับตัวเอง อย่างน้อย 3 ข้อ
3. เรียงลำดับการทำกิจกรรมและออกกำลังกายที่ให้พลังงานจากสูงไปต่ำได้ถูกต้องและครบถ้วน

สื่อการสอน

1. ใบความรู้ “พลังงานและการออกกำลังกาย”
2. ใบงานที่ 1 “ในหนึ่งวันควรทำกิจกรรมอะไรบ้าง”
3. ใบงานที่ 2 “กิจกรรมไหนทำแล้วใช้พลังงานน้อย”
4. ใบงานที่ 3 “มาเรียงการใช้พลังงานจากมากไปน้อยกัน”
5. การบ้าน “ตัวอย่างพลังงานที่ใช้ในแต่ละประเภท”

การประเมินผล

1. สังเกตความสนใจขณะฟังบรรยายและการทำกิจกรรม
2. สังเกตการณ์มีส่วนร่วมในการซักถาม การเล่นเกม และแสดงความคิดเห็นในกลุ่มย่อย
3. นักเรียนสามารถบอกประเภทของกิจกรรมและการออกกำลังกายที่ใช้พลังงานสูงได้
4. นักเรียนสามารถเรียงลำดับการทำกิจกรรมและออกกำลังกายที่ให้พลังงานจากสูงไปต่ำได้

ครั้งที่ 6: เรื่อง …ฉลาดรู้กับฉลากโภชนาการ และโทษของน้ำอัดลม ขนมกรุบกรอบ

วัตถุประสงค์เฉพาะ : เพื่อให้นักเรียน

1. บอกถึงความสำคัญของฉลากโภชนาการ และอ่านได้อย่างถูกต้อง อย่างน้อย 2 ข้อ
2. บอกถึงผลเสียต่อการบริโภคน้ำอัดลม และขนมกรุบกรอบได้ อย่างน้อย 3 ข้อ

สื่อการสอน

1. ภาพสไลด์ประกอบคำบรรยาย
2. ใบความรู้ “ฉลาดรู้กับฉลากโภชนาการ และโทษของน้ำอัดลม ขนมกรุบกรอบ”
3. ใบงานที่ 1 “ฉลาดเลือกกับฉลากโภชนาการ”
4. ใบงานที่ 2 “โทษของน้ำอัดลม”
5. ใบงานที่ 3 “นิทานเรื่องโทษของขนมกรุบกรอบ”
6. การบ้าน “แบบบันทึกภาวะโภชนาการของฉัน”

การประเมินผล

1. สังเกตความสนใจขณะดูภาพ ฟังบรรยาย และการทำกิจกรรม
2. สังเกตการมีส่วนร่วมในการซักถาม การเล่นเกม และการแสดงความคิดเห็น
3. นักเรียนสามารถบอกประโยชน์ของฉลากโภชนาการและเปรียบเทียบผลิตภัณฑ์สุขภาพได้
4. นักเรียนสามารถบอกผลเสียของการบริโภคน้ำอัดลม และขนมกรุบกรอบได้

2. The obesity control program for food cookers

โปรแกรมการให้โภชนศึกษาสำหรับผู้ประกอบอาหารให้เด็กนักเรียนที่มีภาวะโภชนาการเกิน

ครั้งที่ 1: เรื่อง ...โรคอ้วนในเด็ก และการป้องกัน

วัตถุประสงค์เฉพาะ : เพื่อให้ผู้ประกอบอาหาร

1. บอกสาเหตุ ผลกระทบของโรคอ้วนได้อย่างน้อย 3 ข้อ
2. บอกวิธีการป้องกันโรคอ้วนได้อย่างน้อย 3 ข้อ
3. ประเมินภาวะโภชนาการโดยใช้กราฟการเจริญเติบโตในเด็กอายุต่ำกว่าปี 18ได้อย่างถูกต้อง
4. บันทึกแบบบริโภคอาหาร 24 ชม แบบบันทึกการออกกำลังกาย และสามารถใช้หน่วยการตวงในครัวเรือนได้อย่างถูกต้อง

สื่อการสอน

1. ภาพสไลด์ประกอบคำบรรยาย กิจกรรมของโครงการและรูปภาพเด็กอ้วน และผลกระทบ
2. ใบความรู้ "โรคอ้วนเกิดจากอะไร และแนวทางแก้ไข"
3. ภาพสไลด์ประกอบคำบรรยายแสดงกราฟเกณฑ์การอ้างอิงการเจริญเติบโต
4. ใบงานที่ 1 "โรคอ้วนเกิดจากอะไร และแนวทางแก้ไข"
5. ใบงานที่ 2 "อาหารประเภทใดทำให้อ้วน"
6. อุปกรณ์การวัดตามครัวเรือน เช่น ช้อนโต๊ะ ช้อนชา ทัพพี เป็นต้น
7. เอกสารความรู้ "โรคอ้วน และการป้องกัน"

การประเมินผล

1. สังเกตความสนใจขณะดูภาพ ฟังบรรยาย และการทำกิจกรรม
2. สังเกตการมีส่วนร่วมในการซักถาม และการแสดงความคิดเห็น
3. ผู้ประกอบอาหารสามารถบอกถึงสาเหตุของโรคอ้วนและการป้องกันโรคอ้วนได้
4. ผู้ประกอบอาหารสามารถอธิบายและประเมินผลภาวะโภชนาการโดยใช้น้ำหนักเทียบตามเกณฑ์ส่วนสูง และเทียบกับกราฟของกรมอนามัย กระทรวงสาธารณสุข พ .ศ.2542 ของตนเองได้อย่างถูกต้อง
5. ผู้ประกอบอาหารสามารถประเมินปริมาณและน้ำหนักของอาหารตามหน่วยวัดในครัวเรือนได้

ครั้งที่ 2: เรื่อง …การจัดอาหารกลางวัน กินพอดี ไม่มีอ้วน

วัตถุประสงค์เฉพาะ : เพื่อให้ผู้ประกอบอาหาร

1. อธิบาย ประเภท ชนิด และประโยชน์ของอาหารหลัก 5 หมู่ได้ถูกต้องอย่างน้อย 3 หมู่
2. อธิบายสัดส่วนของหมวดอาหารที่ควรได้รับตามธงโภชนาการ
3. วางแผนการจัดอาหารกลางวันให้แก่นักเรียนได้อย่างเหมาะสม ทั้งปริมาณ และคุณภาพ

สื่อการสอน

1. ภาพสไลด์ประกอบคำบรรยาย สรุปการทำกิจกรรมครั้งก่อน ภาพธงโภชนาการและโภชนบัญญัติ 9 ประการ
2. โปสเตอร์ “ธงโภชนาการ” และ “โภชนบัญญัติ 9 ประการ”
3. ใบความรู้ “การจัดอาหารกลางวัน กินพอดี ไม่มีอ้วน”
4. ใบงานที่ 1 “เมนูอาหารกลางวันกับอาหารหลัก 5 หมู่”
5. ใบงานที่ 2 “ปริมาณอาหารกลางวันของหนู”
6. ใบงานที่ 3 “มาคำนวณผักเพื่อใช้ในการประกอบอาหารกันเถอะ”
7. ตัวอย่างปริมาณอาหารจริงตามส่วนของธงโภชนาการ

การประเมินผล

1. สังเกตความสนใจขณะดูภาพ ฟังบรรยาย และการทำกิจกรรม
2. สังเกตการมีส่วนร่วมในการซักถาม การเล่นเกม และการแสดงความคิดเห็น
3. ผู้ประกอบอาหารสามารถบอกถึงชนิดของอาหารหลัก 5 หมู่ สัดส่วนของอาหารที่ควรได้รับตามธงโภชนาการ และข้อควรปฏิบัติในโภชนบัญญัติ 9 ประการ
4. ผู้ประกอบอาหารสามารถคำนวณปริมาณผักที่ใช้ในมื้ออาหารกลางวันของนักเรียนได้

ครั้งที่ 3: เรื่อง … โทษของน้ำอัดลม ขนมกรุบกรอบ และขนมสุขภาพในโรงเรียน

วัตถุประสงค์เฉพาะ : เพื่อให้ผู้ประกอบอาหาร

1. บอกถึงผลเสียของการบริโภคน้ำอัดลม และขนมกรุบกรอบได้ อย่างน้อย 3 ข้อ
2. บอกถึงตัวอย่างขนมสุขภาพในโรงเรียน อย่างน้อย 5 ชนิด

สื่อการสอน

1. ภาพสไลด์ประกอบคำบรรยาย
2. ใบความรู้ “โทษของน้ำอัดลม ขนมกรุบกรอบ และขนมสุขภาพในโรงเรียน”
3. ใบงานที่ 1 “โทษของน้ำอัดลม”
4. ใบงานที่ 2 “ส่วนประกอบของขนมกรุบกรอบ”
5. ตัวอย่างขนมกรุบกรอบที่นักเรียนชอบกิน ประมาณ 4-5 ชนิด

การประเมินผล

1. สังเกตความสนใจขณะดูภาพ ฟังบรรยาย และการทำกิจกรรม
2. สังเกตการมีส่วนร่วมในการซักถาม การทำกิจกรรมกลุ่ม และการแสดงความคิดเห็น
3. ผู้ประกอบอาหารสามารถบอกผลเสียของการบริโภคน้ำอัดลม และขนมกรุบกรอบได้
4. ผู้ประกอบอาหารสามารถบอกถึงตัวอย่างขนมสุขภาพในโรงเรียนได้

ครั้งที่ 4: เรื่อง …ฉลาดรู้กับฉลากโภชนาการ

วัตถุประสงค์เฉพาะ : เพื่อให้ผู้ประกอบอาหาร

1. บอกความสำคัญ ประโยชน์ของฉลากโภชนาการ และอ่านได้อย่างถูกต้อง อย่างน้อย 3 ข้อ
2. อ่านฉลากโภชนาการและเปรียบเทียบผลิตภัณฑ์สุขภาพได้ อย่างน้อย 3 ประเภท

สื่อการสอน

1. ภาพสไลด์ประกอบคำบรรยาย
2. ใบความรู้ “ฉลาดรู้กับฉลากโภชนาการ
3. ใบงานที่ 1 “ฉลากเลือกกับฉลากโภชนาการ”
4. แบบบันทึกการทำกิจกรรมเพื่อควบคุมโรคอ้วนของนักเรียนในโรงอาหาร

การประเมินผล

1. สังเกตความสนใจขณะดูภาพ ฟังบรรยาย และการทำกิจกรรม
2. สังเกตการมีส่วนร่วมในการซักถาม การทำกิจกรรม และการแสดงความคิดเห็น
3. ผู้ประกอบอาหารสามารถบอกถึงประโยชน์ของฉลากโภชนาการ
4. ผู้ประกอบอาหารสามารถอ่านฉลากโภชนาการและเปรียบเทียบผลิตภัณฑ์สุขภาพได้

3. The obesity control program for parents

โปรแกรมการให้โภชนศึกษาสำหรับผู้ปกครองของเด็กนักเรียนที่มีภาวะโภชนาการเกิน

ครั้งที่ 1: เรื่อง ...โรคอ้วนในเด็ก และการป้องกัน

วัตถุประสงค์เฉพาะ : เพื่อให้ผู้ปกครอง

1. บอกถึงสาเหตุ ผลกระทบของโรคอ้วนได้ อย่างน้อย 3 ข้อ
2. บอกถึงวิธีการป้องกันโรคอ้วนได้ อย่างน้อย 3 ข้อ
3. ประเมินภาวะโภชนาการโดยใช้กราฟการเจริญเติบโตในเด็กอายุต่ำกว่าปี 18ได้ถูกต้อง
4. บันทึกแบบบริโภคอาหาร 24 ชม แบบบันทึกการออกกำลังกาย และสามารถใช้หน่วยการตวงในครัวเรือนได้อย่างถูกต้อง

สื่อการสอน

1. ภาพสไลด์ประกอบคำบรรยาย กิจกรรมของโครงการและรูปภาพเด็กอ้วน และผลกระทบ
2. ภาพสไลด์ประกอบคำบรรยายแสดงกราฟเกณฑ์การอ้างอิงการเจริญเติบโต
3. แบบจำลองอาหาร พร้อมหน่วยวัดอาหาร เช่น ถ้วยตวง
4. ใบความรู้ “โรคอ้วนในเด็ก และการป้องกัน”
5. ใบงาน ที่ 1 “โรคอ้วนเกิดจากอะไร และแนวทางแก้ไข”
6. เอกสารความรู้ “โรคอ้วน และการป้องกัน”

การประเมินผล

1. สังเกตความสนใจขณะดูภาพ ฟังบรรยาย และการทำกิจกรรม
2. สังเกตการมีส่วนร่วมในการซักถาม และการแสดงความคิดเห็น
3. ผู้ปกครองสามารถบอกถึงสาเหตุของโรคอ้วนและการป้องกันโรคอ้วนได้
4. ผู้ปกครองสามารถอธิบายและประเมินผลภาวะโภชนาการโดยใช้น้ำหนักเทียบตามเกณฑ์ส่วนสูง และเทียบกับกราฟของกรมอนามัย กระทรวงสาธารณสุข พ .ศ.2542 ของลูกตนเองได้
5. ผู้ปกครองสามารถเข้าใจวิธีบันทึกการบริโภคอาหาร 24 ชั่วโมง และบันทึกการทำกิจกรรมและการออกกำลังกายได้
6. ผู้ปกครองสามารถประเมินปริมาณและน้ำหนักของอาหารตามหน่วยวัดในครัวเรือนได้

ครั้งที่ 2: เรื่อง …ขนมและเครื่องดื่มเพื่อสุขภาพ โทษของน้ำอัดลม ขนมกรุบกรอบ และการอ่านฉลากโภชนาการ

วัตถุประสงค์เฉพาะ : เพื่อให้ผู้ปกครอง

1. บอกวิธีการเลือกอาหารว่าง เครื่องดื่ม และขนม สำหรับเด็กได้
2. บอกผลเสียต่อการบริโภคน้ำอัดลม และขนมกรุบกรอบได้
3. บอกความสำคัญของฉลากโภชนาการ และอ่านได้อย่างถูกต้อง

สื่อการสอน

1. สไลด์ประกอบคำบรรยายของการทำการสอนโภชนศึกษาและการทำกิจกรรมของเด็กนักเรียนที่ดำเนินการไปแล้ว
2. ใบความรู้ “ขนมและเครื่องดื่มเพื่อสุขภาพ โทษของน้ำอัดลม ขนมกรุบกรอบ และการอ่านฉลากโภชนาการ”
3. ใบงานที่ 1 “โทษของน้ำอัดลม”
4. ใบงานที่ 2 “ฉลาดเลือกกับฉลากโภชนาการ”

การประเมินผล

1. สังเกตความสนใจขณะฟังบรรยายและการทำกิจกรรม
2. สังเกตการณ์มีส่วนร่วมในการซักถาม การเล่นเกม และการแสดงความคิดเห็นในกลุ่มย่อย
3. ผู้ปกครองสามารถบอกวิธีการเลือกขนมและเครื่องดื่มเพื่อสุขภาพ
4. ผู้ปกครองสามารถบอกผลเสียของการบริโภคน้ำอัดลม ขนมกรุบกรอบที่มีผลต่อลูกได้
5. ผู้ปกครองสามารถบอกถึงประโยชน์ของฉลากโภชนาการ และสามารถเลือกอาหารสุขภาพให้ลูกจากฉลากโภชนาการได้

APPENDIX E
PHOTOGRAPHS OF ACTIVITIES

Phase I: Existing knowledge analysis




Phase II: Program development



Phase III: Implementing and evaluation program

APPENDIX F

CERTIFICATE OF ETHICAL APPROVAL

Certificate of Approval
Ethical Review Committee for Human Research
Faculty of Public Health, Mahidol University

COA. No. MUPH 2012-100

Protocol Title :	DEVELOPMENT OF THE OBESITY CONTROL PROGRAM IN ELEMENTARY SCHOOL STUDENTS
Protocol No. :	223/2554
Principal Investigator :	Miss Jaruwan Phaitrakoon
Affiliation :	Doctor of Public Health (International Program) Faculty of Public Health, Mahidol University
Approval Includes :	1. Project proposal 2. Information sheet 3. Informed consent form 4. Data collection form/Program or Activity plan
Date of Approval :	28 February 2012
Date of Expiration :	27 February 2013

The aforementioned project have been reviewed and approved according to the Declaration of Helsinki by Ethical Review Committee for Human Research, Faculty of Public Health, Mahidol University.

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PUBLICATION / PRESENTATION

The Ensign of Spirit Project for Relationship Strengthening and Peer Support, Tambon Banphra Health Center, Banphra Sub-district, Muang District, Prachinburi Province. Thai Pharmaceutical and Health Science Journal, Vol.6 No. 2, April –June, 2011,p 130-136.